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Penstemon calycosus, reported new to Missouri in article on p. 16.
Photo: John Hilty, Illinois Wildflowers

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FROM THE EDITOR

This issue embraces an expanded vision for *Missouriensis*, to better serve the goals of the Society and its membership. The journal continues to be a vehicle for sharing botanical knowledge by focusing on issues related to Missouri plants, natural systems, and conservation of our floristic resources. This issue begins what I hope will be an enduring tradition of honoring these goals through an expanded focus beyond the political boundaries of the state. Just as any habitat or natural community is an inseparable part of, and influenced by, a larger system, our knowledge of Missouri's plant heritage benefits from a broader perspective of the performance of plants and natural communities beyond our immediate boundaries. Another reason for an expanded focus is the lack of outlets to disseminate valuable technical information in several neighboring states, including some with active native plant societies.

Missouriensis and the Society can thus play a role as a regional center sharing research and discoveries related to field-based aspects relevant to native plants, with benefits to all concerned with native flora and ecological systems.

In addition to traditional Missouri-focused articles, this issue includes papers related to, but not solely focused on, Missouri plants and vegetation. I hope we can continue to develop *Missouriensis* along these lines, as well as expanding the journal to include material essential to understanding our plants and vegetation, including local research involving pollinators, urban plant dynamics, fungi, soil relationships, and other topics. This will bring an expanded focus without losing sight of or diluting the essential goals for which the Society was established: the enjoyment, preservation, conservation, restoration, and study of Missouri's native plants.

This issue is a product of the contributing authors and several talented and dedicated reviewers who generously donated their time and skills. For this, appreciation is extended to Michelle Bowe – Missouri State University, Aaron Floden – Missouri Botanical Garden, Paul McKenzie – U.S. Fish & Wildlife Service, Caleb Morse – University of Kansas, John Taft – Illinois Natural History Survey, Justin Thomas- NatureCITE, Gerould Wilhelm – Conservation Research Institute, and George Yatskievych – University of Texas. Thanks are also extended to Malissa Briggler – Missouri Department of Conservation, Jim Solomon – Missouri Botanical Garden, and Dana Thomas – NatureCITE, for their contributions and assistance. As with every issue since *Missouriensis* 33, Cindy Pessoni of The Nature Conservancy has played an irreplaceable role in formatting, design, copy editing, and proofing; the journal is greatly improved through her efforts. Jerry Barnabee, the Society's webmaster, makes electronic access to the journal easy and user-friendly.

Submissions and queries regarding manuscripts for potential publication, including reviews of relevant books, are always welcome, as are suggestions and comments.

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Pilea fontana (Urticaceae) discovered new to Missouri

AARON J. FLODEN¹ AND MEGAN ENGELHARDT²

ABSTRACT. — *Pilea fontana* is reported new to the flora of Missouri from several small glacial fens in Lafayette County, Missouri, in the central-western part of the state. The habitat, associated flora, and images of the species and its distinctive achenes are provided. A key is provided to distinguish the two species of *Pilea* in Missouri, which are well differentiated by the shape, color, and surface texture of their achenes.

Pilea Lindl. (Urticaceae) is a large cosmopolitan genus comprised of approximately 400 or more species with a worldwide distribution except for Australia and New Zealand (Boufford 1997). In continental North America there are 5–6 species with two, *P. pumila* (L.) A. Gray and *P. fontana* (Lunell) Rydb., occurring across the eastern half of the continent (Boufford 1997, Hermann 1940, Fernald 1936). *Pilea pumila* is the more common of the two species and is found ubiquitously, but as scattered individuals in moist shaded habitats (Boufford 1997, Hermann 1940). In contrast *Pilea fontana* occurs abundantly in marshy to wet habitats, appearing like masses of seedlings or smaller sized plants of *P. pumila* (Hermann 1940). The distribution of *P. fontana* in adjacent states north and east of Missouri is scattered and occurs in several counties in northern Iowa, a few counties in southwestern Illinois, and in eastern Nebraska (Kartesz 2015). *Pilea fontana* is here confirmed for the flora of Missouri from a recent series of collections from three neighboring glacial fens.

The glacial fens of central-western Missouri are a rare habitat confined to lower slopes where water seeps from the hillside and forms small complexes of mucky to well-drained but wet glacial till with prominent rivulets (Missouri Department of Conservation [MDC] 2017, Community rank of S1). In Lafayette County on 3 September 2019 we had an opportunity to visit a series of privately-owned fens that had records of the facultative wetland *Epilobium leptophyllum* (MDC 2017, S1 rank) to make a seed bank collection of this species. In the first fen *E. leptophyllum* was present as a few individuals and co-occurred with *Chelone glabra* var. *linifolia* Coleman, *Impatiens capensis* L., *Geum laciniatum* Murray, *Sagittaria latifolia* Willd., *Solidago gigantea* Aiton and other spp., *Typha* spp., numerous sedges in sterile condition but *Carex frankii* Kunth still with fertile spikes, and numerous Poaceae including *Phragmites*, *Glyceria*, and *Elymus*. Dominant among this association were many *Pilea* that appeared to be different from typical *P. pumila* (Fig. 1). The *Pilea* appeared to be smaller in size, less than 35 cm tall, but many of the plants were found to be branches growing upward from larger plants that had fallen over. The plants were still growing conspicuously dense, with hundreds of plants occurring in small areas of

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the fen. The leaves did not have a lustrous appearance, the maturing achenes were notably and consistently dark on all plants observed, and they were growing in flowing spring water.



Figure 1. *Pilea fontana* in habitat showing the density of individuals growing in running water at the head of one of the glacial fens. Photo by Aaron Floden.

Two adjacent larger fens were also dominated by *Pilea*, but the plants in these fens were smaller than those in the first fen. One part of the second fen consisted of approximately three hundred feet of the lower slope of a hill where water drained and created an expansive mucky fen. *Pilea fontana* dominated the head of the fen. At 5–10 meters from the water source where flowing water on the surface was reduced the *Pilea* was less abundant, grew less densely, and was mixed with *Impatiens capensis* and *Boehmeria cylindrica* (L.) Sw. The third fen was oblong in shape with a prominent rivulet near the source that expanded into a grassy-sedge-*Typha* dominated mucky fen. Immature achenes of the *Pilea* were observed in the field with a 10× hand

lens and were consistently dark and appeared lumpy under low magnification (Fig. 2). Collections were made and identified upon returning from the field. These plants were in fact different from *P. pumila* and represented the first *P. fontana* collections from Missouri. The closest this species occurs to the Missouri site is ca. 390 km northwest in Cuming County, Nebraska (Kartesz 2015). *Pilea fontana* was reported from southwest Illinois, but had not been found in adjacent Missouri. A later visit on 1 October 2019 resulted in collection of fully mature plants as well as seeds for the Missouri Botanical Garden seedbank at Shaw Nature Reserve. In the forest surrounding the fens, *Pilea pumila* occurred as scattered individual plants. No plants of *P. fontana* were observed outside of the fen habitat, and no *P. pumila* were observed within the saturated habitat of the fens.

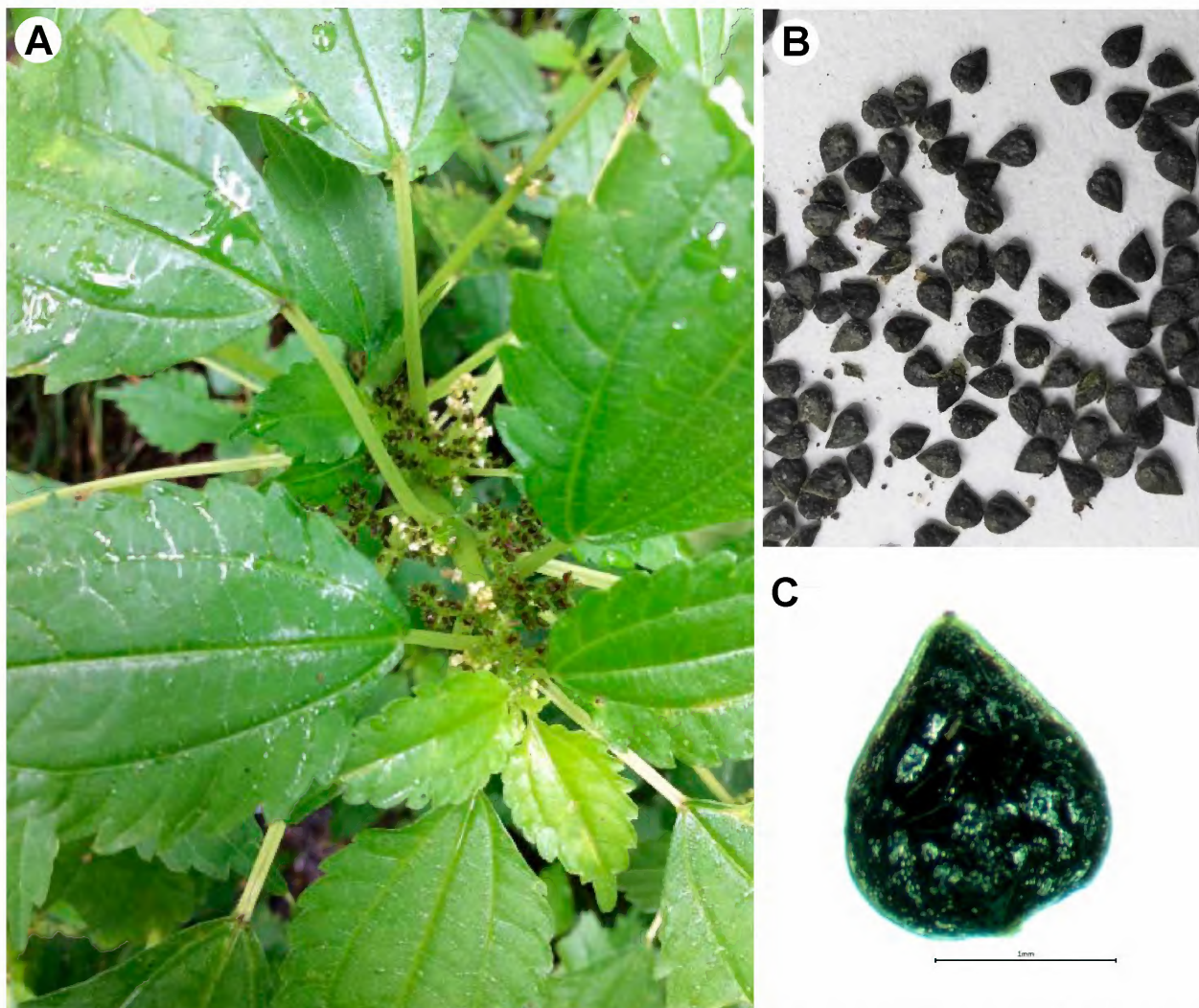


Figure 2. A: *Pilea fontana* showing the infructescences and conspicuous dark achenes; B: near black achenes with rough surfaces; C: a single achene that is black in color, rough textured, and a faint greenish hyaline margin, scale 1 mm. Photos A and C by Megan Engelhardt; photo B by Aaron Floden.

Pilea fontana is distinct in its uniformly dark brown to blackish achenes with narrow greenish rims (Hermann 1940, Fernald 1936, Weakley 2015). *Pilea pumila* achenes are reddish brown, stramineous, or green, or nearly an equal proportion of green with dark brown to black maculation and no green margin. *Pilea pumila* achenes are tear-drop shaped and are generally narrower with a length to width ratio greater than that of *P. fontana* achenes, which have broader bases and are larger overall (Weakley 2015). The surfaces of the achenes are distinctly lumpy or pebbled in texture in *P. fontana*, whereas *P. pumila* achenes are smooth to slightly raised where there are maculations on the surface (Fig. 2; see also Fernald 1936).

Pilea fontana is currently documented from three small fens in Lafayette County that total no more than 2 acres in area. This species should be ranked S1 given the rarity of the habitat in which it occurs, the rarity of the species in the state, and its disjunct distribution from the closest occurrences. Examination of Missouri collections of *Pilea* at MO did not reveal any additional overlooked occurrences of *P. fontana* in the state. Despite this, the limited number of collections of *P. pumila* at MO, or North American *Pilea* in general, does not reflect the frequency at which *P. pumila* is encountered in the field. The under-collection of such a ubiquitous species suggests also that *P. fontana* may be overlooked in suitable habitats. Other fens across the northern portion of the state should be examined for the possibility of additional populations of this species.

KEY TO *PILEA* IN MISSOURI

- 1 Seeds ovoid and the widest point nearly as wide as the total length of the seed, black or dark brown throughout except for pale to greenish margin, surface pebbled in appearance; leaves generally less lustrous ***P. fontana***
- 1 Seeds ovoid and the widest point 3/4 to 1/2 as wide as total length of the seed, light colored green to yellowish-brown with darker red-brown maculation, surfaces smooth or raised only on maculate areas of surface; leaves generally lustrous..... ***P. pumila***

Specimens cited: **U.S.A. MISSOURI:** LAFAYETTE CO.: Glacial fens on south side of Hicklin Lake, north of Hwy 24, at base of slope; first fen approximately 39.184656°, -93.793193°; additional fens west along base of slope, 3 September 2019, Floden & Engelhardt s.n. (MO); *ibidem*, 1 October 2019, Floden, Engelhardt & Turner s.n. (MO).

LITERATURE CITED

- Boufford, D.E. 1997. *Pilea*. In: Flora of North America Editorial Committee, eds. Flora of North America North of Mexico. New York and Oxford: Oxford University Press. Vol. 3, pp. 408-411.
- Fernald, M.L. 1936. *Pilea* in eastern North America. Contributions from the Gray Herbarium 113: 169-170.
- Hermann, F.J. 1940. The geographic distribution of *Pilea fontana*. Torreya 40: 118-120.

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Kartesz, J.T. 2015. The Biota of North America Program (BONAP). *North American Plant Atlas*. (<http://bonap.net/napa>). Chapel Hill, N.C. [maps generated from Kartesz, J.T. 2015. Floristic Synthesis of North America, Version 1.0. Biota of North America Program (BONAP). (in press)].

Missouri Department of Conservation. 2017. Missouri Species and Communities of Conservation Concern. Jefferson City: Missouri Department of Conservation.

Weakley, A.S. 2015. *Flora of the Southern and Mid-Atlantic States*. Chapel Hill: University of North Carolina. 1320 pp.

Report of *Andropogon hallii* in Missouri and Updated Regional Key to the Genus

ANDREW P. BRAUN¹

ABSTRACT. — Taxonomic and ecological information are reported for the first collections of *Andropogon hallii* Hack. in Missouri. An updated key to Missouri species of *Andropogon* is provided.

INTRODUCTION

Andropogon hallii Hack., commonly known as sand bluestem, is a perennial, warm-season grass similar in general appearance to the more widespread *Andropogon gerardii* Vitman. *Andropogon hallii* occurs in dry, sandy soils throughout the Great Plains ecoregion, overlapping in range with *A. gerardii* (Kartesz 2015). Where the two species overlap, *A. gerardii* occupies lower, wetter habitats than *A. hallii*, but hybrids occur in intermediate and nearby disturbed habitats (Romberg 1954, Barnes 1986). The entities in this complex have been treated as varieties (Gould 1975), subspecies (Wipff 1996), or species (Fernald 1950, Hitchcock & Chase 1951, Campbell 2003). Although the two entities can sometimes hybridize under natural conditions, they seem morphologically, ecologically, and geographically distinct enough to be considered discrete species. Barkworth et al. (2007) and Kartesz (2015, citing Barkworth et al. [2007]) included Missouri within the range of *A. hallii* without citation of any specimens, but the most recent floristic works for Missouri (Yatskievych 1999, Ladd & Thomas 2015) as well as geographically broader floras (e.g. Campbell 2003) excluded *A. hallii* from the state.

A recent review of Missouri material labeled as *A. gerardii* at the Missouri Botanical Garden yielded several specimens that key to *A. hallii* based on the density and color of inflorescence hair, length of awns, and presence of a glaucous coat on the foliage. These populations were all collected within a few kilometers of each other in Buchanan county, in an area where a levee of the Missouri River had recently been breached, depositing sand in agricultural fields. Associates listed at this location on Yatskievych et al. 00-74 include *Salix* sp., *Populus* sp. (presumably *P. deltoides* W. Bartram ex Marshall), *Schoenoplectus* sp., *Sporobolus* sp. (presumably *S. cryptandrus* (Torr.) A. Gray), *Triplasis* sp. (presumably *T. purpurea* (Walter) Chapm.), and *Cenchrus* sp. (presumably *C. longispinus* (Hack.) Fernald).

Another population at Missouri Mines State Historic Site in St. Francois County (Fig. 1) was found by the author and later verified by Missouri State Park staff (McCarty & Meinert 2012, Ron Colatskie pers. comm.). This population apparently was planted as part of a bioremediation effort and has persisted and spread sporadically throughout the sandy chat piles at the area.

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Voucher specimens: **U.S.A. MISSOURI:** BUCHANAN CO.: south side of dirt road, 0.3 mi west of junction with U.S. Highway 59, ca. 1.75 mi southwest of Rushville; open area of deep sand with scattered swales; scattered large clumps, plants strongly bluish-glaucous; with *Salix*, *Populus*, *Schoenoplectus*, the higher areas with *Sporobolus*, *Triplasis*, *Cenchrus*, elevation 790 feet, NW1/4 sec. 22 T55N R37W; 18 July 2000, Yatskievych et al. 00-74 (MO). 0.5 mi west of Highway 59, north 1 mi, N of Highway 59/45 intersection, sand deposits along county road; sec. 21 T55N R37W; 31 August 2000, Nagel s.n. (MO). ca. 3 mi east of Winthrop; sandy soil along roadside; NW1/4 sec. 21 T55N R37W; 1 August 2001, Powelson s.n. (MO). ST. FRANCOIS CO.: Missouri Mines State Historic Site, 15S 719147, 14190610, 23 July 2019, Braun 20190723.01 (MO).

DISCUSSION

Propagules establishing the Buchanan county populations may have arrived via floodwaters when the levee was breached or may have spread from an unknown population nearby after the water had receded. Whatever the means of arrival, these populations should be considered a native part of Missouri's flora, as are other edge-of-range Great Plains species associated with dry, sandy, alluvial habitats in northwest Missouri (i.e. *Dalea leporina* (Aiton) Bullock, *Cyperus schweinitzii* Torr., etc.). The St. Francois County population, however, was introduced on an anthropogenic substrate, and can therefore not be considered a native occurrence.

Botanists in neighboring Kansas (Freeman 2014) and Nebraska (Rolfmeier and Steinauer 2013) assigned *A. hallii* a coefficient of conservatism of five, and Drobney et al. (2001) assigned seven to *A. hallii* in Iowa. A moderate coefficient of conservatism seems reasonable for Missouri's ecological checklist as well. Other areas with dry, sandy soils (especially in northwest Missouri and along stabilizing sand bars associated with large river systems) should be searched for additional populations of *A. hallii*.

Yatskievych (1999) reported *A. gerardii* var. *chrysocomus* in Missouri and discussed the taxonomic confusion in the *A. gerardii* complex. The Missouri specimens labeled as *A. gerardii* var. *chrysocomus* at the Missouri Botanical Garden appear to be normal or somewhat hairier forms of typical *A. gerardii*. It seems that this name has been applied variously to hybrids between *A. gerardii* and *A. hallii* (Wipff 1996) or differently hairy forms of either species. Further collection and study of aberrant *A. gerardii* is encouraged to better understand the status of this entity in Missouri. Collections of purported *A. gerardii* var. *chrysocomus* or *A. hallii* should include multiple culms with intact rhizomes, as this can be an important feature in determination.

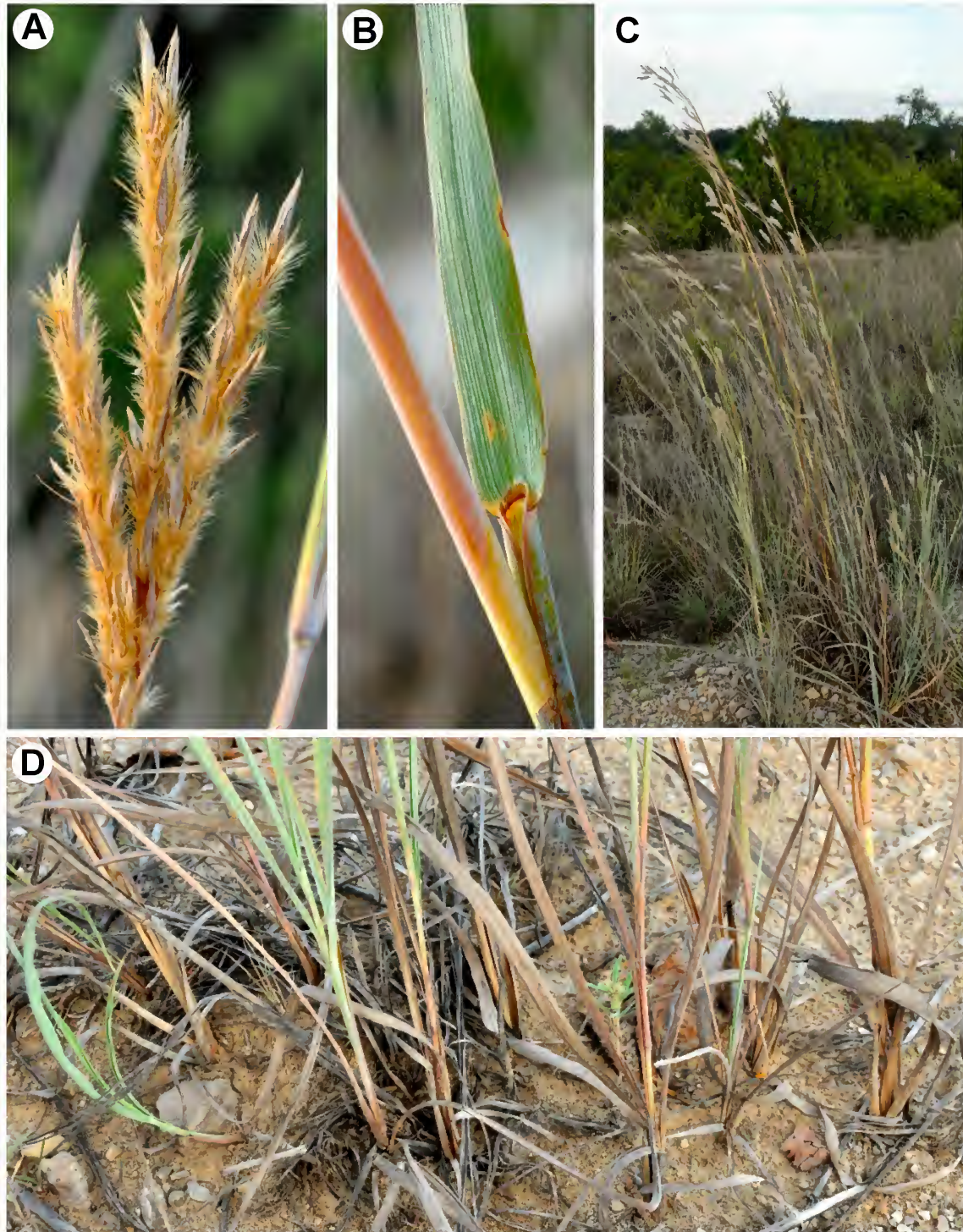


Figure 1. *Andropogon hallii*, St. Francois County, Missouri; **A:** inflorescence showing the short or absent awns and the densely pubescent spikelets; **B:** culm, sheath, ligule, and blade; **C:** habit; **D:** widely spaced culms showing the rhizomatous habit. Photos by author.

Yatskievych (1999) is the most up-to-date regional flora including *Andropogon*. Since 1999, two new additions to the *Andropogon* of Missouri have been discovered: *A. hirsutior* (Thomas 2017) and *A. hallii* reported here. An updated key is provided below to accommodate these recent additions.

KEY TO MISSOURI TAXA OF *ANDROPOGON*

1. Culms not strongly keeled, elliptic to round in cross section; pedicellate spikelet staminate.... **2**
 2. Stems strongly glaucous; awn of sessile spikelet <6 mm long or absent; rhizomatous; inflorescences densely long-villous (somewhat obscuring the inflorescence rachis) with white to yellow hairs; ligule >2.5 mm long..... ***A. hallii* Hack.**
 2. Stems not or somewhat glaucous; awn of sessile spikelet present, >6 mm long; not rhizomatous; inflorescences not densely hairy (inflorescence rachis not or only barely obscured); ligule <2.5 mm long..... ***A. gerardii* Vitman**
1. Culms strongly keeled, appearing flattened; pedicellate spikelet sterile..... **3**
 3. Sessile spikelets 6–7 mm long; peduncles exerted far beyond the subtending raceme sheaths; young vegetative sheaths with red coloration, not so strongly folded so as to make finding the ligule difficult..... ***A. ternarius* Michx.**
 3. Sessile spikelets 4–5 mm long; peduncles usually shorter than the subtending raceme sheaths (sometimes exerted far beyond the raceme sheaths in *A. gyrans*); young vegetative sheaths red or green with red at the very base, strongly folded so as to make finding the ligule difficult..... **4**
 4. Mature culms rusty colored, the uppermost nodes (just below the inflorescence) densely hairy with upward-pointed hairs, young vegetative sheaths red and green; raceme sheaths often greatly inflated, hiding the racemes; peduncles sometimes strongly exerted beyond the subtending raceme sheaths; lemmas of sessile spikelet usually with a kink or twist 2–4 mm beyond the glume.... ***A. gyrans* Ashe**
 4. Mature culms orange-tan colored, the uppermost nodes glabrous or occasionally hairy with upward pointing hairs, young vegetative sheaths light green with red at the very base; raceme sheaths not greatly inflated; peduncles shorter than the subtending raceme sheaths; lemmas of sessile spikelet more or less straight..... **5**
 5. Mature culm sheaths usually not antrorsely scabrous; inflorescence relatively simple or few-branched, not appearing bushy; membranaceous part of ligule <1 mm long; common throughout southern Missouri (Ozarks, Osage Plains, Coastal Plain, less common north of Missouri River) in dry or moist habitats..... ***A. virginicus* L.**
 5. Mature culms sheaths usually antrorsely scabrous (sometimes barely so); inflorescence compound, appearing bushy; membranaceous part of

ligule 0.7–1.2 mm long; uncommon in Coastal Plain and Osage Plains in moist habitats..... ***A. hirsutior* (Hack.) Weakley & LeBlond**

LITERATURE CITED

- Barkworth, M.E., L.K. Anderton, K.M. Capels, S. Long, and M.B. Piep (Eds.). 2007. Manual of Grasses for North America North of Mexico. Logan: Utah State University Press.
- Barnes, P.W. 1986. Variation in the big bluestem (*Andropogon gerardii*)-sand bluestem (*Andropogon hallii*) complex along a local dune/meadow gradient in the Nebraska Sandhills. American Journal of Botany 73(2):172-184.
- Campbell, C.S. 2003. *Andropogon*. In: Flora of North America Editorial Committee, eds. Flora of North America North of Mexico. New York and Oxford: Oxford University Press. Vol. 25, pp. 649-664.
- Drobney, P.D., G.S. Wilhelm, D. Horton, M. Leoschke, D. Lewis, J. Pearson, D. Roosa, and D. Smith. 2001. Floristic quality assessment for the state of Iowa. (https://universalfqa.org/view_databases, accessed 23 August 2019). Unpublished report.
- Fernald, M.L. 1950. Gray's Manual of Botany, 8th ed. New York: D. Van Nostrand.
- Freeman, C.C. 2014. Coefficients of Conservatism for Kansas Vascular Plants and Selected Life History Attributes. Kansas Biological Survey and R.L. McGregor Herbarium, University of Kansas.
- Gould, F.W. 1975. The Grasses of Texas. College Station: Texas A&M University Press.
- Hitchcock, A.S. and A. Chase. 1951. Manual of the Grasses of the United States. 2nd ed. Washington D.C.: U.S. Dept. of Agriculture.
- Kartesz, J.T. 2015. The Biota of North America Program (BONAP). North American Plant Atlas. (<http://bonap.net/napa>). Chapel Hill, N.C. [maps generated from Kartesz, J.T. 2015. Floristic Synthesis of North America, Version 1.0. Biota of North America Program (BONAP). (in press)].
- Ladd, D. and J.R. Thomas. 2015. Ecological checklist of the Missouri flora for floristic quality assessment. Phytoneuron 2015-12: 1-274.
- McCarty, K. and D. Meinert. 2012. St. Joe State Park Natural Resource Management Plan. Jefferson City: Missouri Dept. of Natural Resources unpublished report.
- Rolfsmeier, S. and G. Steinauer. 2013. Vascular Plants of Nebraska (Version I - July 2003), 2013 update. Lincoln: Nebraska Natural Heritage Program, Nebraska Game and Parks Commission.
- Romberg, P.F. 1954. The Taxonomy of the Genus *Andropogon* L. in Nebraska. PhD dissertation, University of Nebraska, Lincoln.
- Thomas, J.R. 2017. New additions, vouchers of old additions, and a new combination (*Dichanthelium inflatum*) for the Missouri flora. Missouriensis 34: 4-19.
- Wipff, J.K. 1996. Nomenclatural combinations in the *Andropogon gerardii* complex (Poaceae: Andropogoneae). Phytologia 80(5):343-347.
- Yatskievych, G. 1999. Steyermark's Flora of Missouri. Vol. 1. Jefferson City: Missouri Dept. of Conservation.

Liverworts and Hornworts of the Interior Highlands Exsiccatae — Fascicle 5

JOHN J. ATWOOD¹ AND JOHN C. BRINDA²

ABSTRACT. — Sets of ten liverwort specimens from the Interior Highlands of North America are issued in this fifth exsiccatae fascicle. The second Missouri station of *Fossombronina texana* is reported with the plants included in this fascicle. The distribution of *Frullania styliifera* is expanded to include eight additional Missouri counties, as well as the first documented localities in Illinois, Kansas and New York.

The discovery of unreported taxa, as well as the general lack of representative liverwort and hornwort specimens from the Interior Highlands in herbaria, has compelled the authors to prepare an exsiccatae based on their collections from southern Missouri, northwestern Arkansas, and parts of southern Illinois, southeastern Kansas, and eastern Oklahoma. The exsiccatae is issued in fascicles of ten specimens that are distributed to the following herbaria: CAS, DUKE, E, F, GOET, KPABG, MHA, NICH and NY. The primary set of specimens is deposited at MO. Four fascicles have previously been distributed (Atwood & Brinda 2013, 2013a, 2014, 2015). In this fascicle, notes are given on the distributions of *Fossombronina texana* and *Frullania styliifera*.

41. *Aneura sharpii* Inoue & N.G. Mill.

U.S.A. MISSOURI: WAYNE CO.: Coldwater Conservation Area. Forested seep along south branch of Hunter Creek hummock, on soil at base of clumped shrubs, 642 ft., 37.25838°N, 90.40077°W, 3 April 2019, *Atwood 3717 & Brant*.

42. *Fossombronina texana* Lindb.

U.S.A. MISSOURI: TANEY CO.: Beaver Township, Town of Hercules. Along Hwy. 125, approximately 3.5 miles south of Hwy. DD, at bridge over Brushy Creek. Just west of Hercules Church, shaded, E-facing dolomite ledges along creek, 921 ft., 36.70496°N, 92.87155°W, 23 September 2017, *Atwood 3523 & Holmberg*.

Lindberg (1875) described *F. texana* from part of Austin's (1873) *Hepaticae Boreali-Americanae Exsiccatae*, no. 118 (*F. longiseta* Austin), which is a mixture of Texas plants collected by Charles Wright and California plants collected by Henry Bolander. The Texas plants belong to *F. texana*, and differ from *F. longiseta* in gametophyte and spore morphology. Although the two species are similar in their size and monoicous sexuality and have oblong leaves, plants of *F. texana* lack tubers at the stem apices, and have leaves with auriculate antical margins. By

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comparison, plants of *F. longiseta* usually have prominent apical tubers, while the antical leaf margins extend only to the middle of the stem. Furthermore, the spores of both species are polymorphic, but those of *F. texana* generally have an irregularly reticulate ornamentation on the distal surface, whereas the distal surface ornamentation in the spores of *F. longiseta* are more regularly lamellate to echinate.

The Taney County specimen, cited here, matches the description of *F. texana* by Bray (2001), with the spores most closely resembling Schuster's detailed illustrations of the species (1992, fig. 843, 4–7). The spores are 38–44 μm in diameter, with low, thin lamellae, approximately 2 μm tall. The lamellae are frequently spurred, with rows 4–6 μm apart, sometimes forming irregularly connected areolae that are about 6 μm in diameter. Most spores examined have the outlines of 3–4 weakly formed areolae spanning the outer spore face. The inner spore face is cristate, with a weakly defined tri-radiate ridge.

The known distribution of *F. texana* in North America was expanded by Schuster (1992) who cited several specimens from west-central Texas as well as two specimens from counties in northwestern Arkansas. Bray (2001) further expanded this distribution by citing fourteen additional Texas localities from counties throughout the Edwards Plateau region, as well as six new stations in the Interior Highlands of Arkansas, Missouri and Oklahoma. His report of the species from Missouri (*Redfearn 4684* [MO]), and Oklahoma (*Mahler 1000, 1101* [both SMU]) represents new, but overlooked distribution records for those states (Atwood 2014; Timme & Redfearn 2012). The Taney County station is approximately 100 miles southeast of the other Missouri locality, and about 50 miles north of the two closest Arkansas localities. As indicated by the similar habitat data for nearly all of these specimens, *F. texana* is calciphilic, occurring on limestone near streams.

43. *Frullania riparia* Hampe ex Lehm.

U.S.A. MISSOURI: WARREN CO.: Little Lost Creek Conservation Area, steep and narrow draw leading to the southeastern branch of Low Gap Hollow, on shaded sides of dolomite boulders, 735 ft., 38.75668°N, 91.26910°W, 25 March 2019, *Atwood 3693, Holmberg & Turner*.

44. *Frullania styliifera* (R.M. Schust.) R.M. Schust.

U.S.A. MISSOURI: MONTGOMERY CO.: Grand Bluffs Conservation Area, Grand Bluffs Natural Area, forested bluff top approximately 0.8 mile NE of Bluffton. Persimmon grove with 3–4" dbh trees on SW-slope, on tree trunks with *Frullania eboracensis*, 850–900 ft., 38.70690°N, 91.60897°W, 24 July 2018, *Atwood 3672*.

Atwood (2016) reported *F. styliifera* from several localities in Arkansas, Missouri, Oklahoma and Tennessee, expanding the known distribution of the species. Prior to that publication, *F. styliifera* was previously known only from the type locality in southern Minnesota. Additional collecting, as well as the redetermination of herbarium specimens, has revealed several

new Missouri localities. In addition, new state distribution records from Illinois, Kansas and New York are documented here for the first time.

Additional specimens examined: **U.S.A. ILLINOIS:** RANDOLPH CO.: Turkey Bluffs State Fish and Wildlife Area, 8 km SE of Chester, along road, 0.15 miles W of road junction, on ash trunks in disturbed woods, associated with *F. inflata* and *F. virginica*, 670 ft., 37.86916°N, 89.74777°W, 27 April 2018, *Holmberg 6118 p.p.* (MO). **KANSAS:** CHEROKEE CO.: 4 miles E of Baxter Springs, bank of Shoal Creek, 8 July 1952, *McGregor 5650* (as *F. inflata* Gottsche) (NY). **MISSOURI:** LACLEDE CO.: Bear Creek Conservation Area, beside road, 20 m SE of parking lot, sparse on trunk of large oak tree, fallen in ice storm, in oak/hickory woods, 1215 ft., 37.73361°N, 92.57944°W, 2 February 2007, *Holmberg 2162* (as *F. eboracensis* Lehm.) (MO). LINCOLN CO.: Cuivre River State Park, Blazing Star Trail, 25 yds. N of trailhead, off RV campground road, T49N R1E S4, several small patches growing on bark of 10" diameter *Quercus alba*, alongside trail at edge of upland oak-hickory forest strip, 650 ft., 9 October 2003, *Darigo 3996* (MO) (as *F. inflata*). OZARK CO.: Mark Twain National Forest. Glade Top Trail National Forest Scenic Byway, Caney Picnic Area, along Hwy. 935, on bark, trunk of elm, 1224 ft., 36.74321°N, 92.76023°W, 23 September 2017, *Atwood 3515* (MO). Mark Twain National Forest. 'McClurg Glade', along Glade Top Trail and Hwy. 932, approximately 1.25 miles west of Douglas County Rd. in McClurg, on bark, branches and trunk of smoke tree, 1300 ft., 36.78278°N, 92.75083°W, 23 September 2017, *Atwood 3511* (MO). PHELPS CO.: Mark Twain National Forest, Lane Spring Recreation Area, Blossom Rock Trail at Blossom Rock, on bark, oak tree along south-rockface, mixed with *Frullania eboracensis*, 1012 ft., 37.79401°N, 91.82923°W, 22 September 2017, *Atwood 3495 & Holmberg* (MO). ST. FRANCOIS CO.: Saint Francois State Park, small creek valley, 0.22 airline miles from junction, US Hwy. 67 & secondary entrance for service road in northern part of Park, oak-hickory forest, on fallen living canopy branch of red oak tree, 250 m., 37.99194°N, 90.51916°W, 11 July 2014, *Davidse 41774* (MO). VERNON CO.: Pleasant Run Creek Prairie (Missouri Prairie Foundation), 270 meters N of road, on fallen elm trunk along creek in native prairie, 820 ft., 37.65138°N, 94.34666°W, 3 June 2018, *Holmberg 6141* (MO). WARREN CO.: Little Lost Creek Conservation Area, in the southeastern branch of Low Gap Hollow, on upper branches of recently fallen tree along a steep slope, 671 ft., 38.75498°N, 91.27361°W, 25 March 2019, *Atwood et al. 3705A* (MO). **NEW YORK:** NIAGARA CO.: New York Office of Parks, Recreation and Historic Preservation, Golden Hill State Park, picnic areas near boat launch, on *Fraxinus*, 80 m., 43.36972°N, 78.47381°W, 4 June 2018, *Brinda 12027* (MO).

45. *Kurzia sylvatica* (A. Evans) Grolle

U.S.A. MISSOURI: SAINTE GENEVIEVE CO.: Hickory Canyon Natural Area, Benne Tract, side canyon along S-branch of Hickory Creek, ca. 0.33 mile N, and 0.35 mile W of Sprott Rd., steep-sided box canyon with numerous boulders, dripping ledges, seasonal waterfall and pool, underside of N-facing ledge, 948 ft., 37.86970°N, 90.30960°W, 20 April 2018, *Atwood 3610*.

46. *Lophocolea heterophylla* (Schrader) Dumort. subsp. *heterophylla*

U.S.A. MISSOURI: WARREN CO.: Little Lost Creek Conservation Area, main branch of Low Gap Hollow, on well-rotted log at base of dripping bluff, 607 ft., 38.75542°N, 91.27819°W, 25 March 2019, *Atwood 3712, Holmberg & Turner*.

47. *Marchantia polymorpha* subsp. *ruderalis* Bischl. & Boissel.-Dub.

U.S.A. MISSOURI: SAINT LOUIS CITY: Missouri Botanical Garden. In flower bed near southeast (Tower Grove Avenue) entrance, on shaded bare soil and mulch, 533 ft., 38.61083°N, 90.25861°W, 30 June 2018, *Atwood 3671*.

48. *Odontoschisma sphagni* (Dicks.) Dumort.

U.S.A. MISSOURI: SAINTE GENEVIEVE CO.: Hickory Canyon Natural Area, Benne Tract, rock house near entrance to side canyon off Hickory Creek, ca. 450 yds. north and 290 yds. west of Sprott Rd., beneath overhang, base of back wall, in mats with *Calypogeia*, *Diplophyllum* and *Leucobryum*, 885 ft.: 37.86943°N, 90.30618°W, 3 March 2018, *Atwood 3582 & Holmberg*.

49. *Pellia epiphylla* (L.) Corda

U.S.A. MISSOURI: SAINTE GENEVIEVE CO.: Hickory Canyon Natural Area, Benne Tract, small drainage up side canyon along south branch of Hickory Creek, approximately 560 yds. north and 370 yds. west of Sprott Rd., in loose, thick mats, partially peeling off of dripping wet, vertical sandstone rock wall, 814 ft., 37.87023°N, 90.30726°W, 3 March 2018, *Atwood 3586 & Holmberg*.

50. *Riccardia multifida* (L.) Gray subsp. *multifida*

U.S.A. MISSOURI: WAYNE CO.: Coldwater Conservation Area. Forested seep along south branch of Hunter Creek, on wet gravel deposits along creek, 600 ft., 37.26043°N, 90.40203°W, 3 April 2019, *Atwood 3722 & Brant*.

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LITERATURE CITED

- Atwood, J.J. 2014. A literature-based checklist of the liverworts and hornworts reported from Missouri. *Missouriensis* 32: 1–40.
- Atwood, J.J. 2016. New stations for *Frullania styliifera* (Frullaniaceae) outside of the type locality. *Evansia* 33: 96–100.
- Atwood, J.J. and J.C. Brinda. 2013. Liverworts and Hornworts of the Interior Highlands Exsiccatae. Fascicle I (Nos 1–10). St. Louis: Missouri Botanical Garden. 6 pp.
- Atwood, J.J. and J.C. Brinda. 2013a. Liverworts and Hornworts of the Interior Highlands Exsiccatae. Fascicle II (Nos. 11–20). St. Louis: Missouri Botanical Garden, 5 pp.
- Atwood, J. J. and J.C. Brinda. 2014. Liverworts and Hornworts of the Interior Highlands Exsiccatae. Fascicle III (Nos. 21–30). St. Louis: Missouri Botanical Garden. 5 pp.
- Atwood, J. J. and J.C. Brinda. 2015. Liverworts and Hornworts of the Interior Highlands Exsiccatae. Fascicle IV (Nos. 31–40). St. Louis: Missouri Botanical Garden. 5 pp.
- Austin, C.F. 1873. Hepaticae Boreali-Americanae Exsiccatae; or Specimens of North American Liverworts. Closter, NJ: Arranged by Coe Finch Austin. Numbers 1–150.
- Bray, J. R. 2001. A Revision of the Genus *Fossombronia* Raddi in North America, North of Mexico, and Europe. PhD Dissertation, Southern Illinois University, Carbondale. 362 pp.
- Lindberg, S.O. 1875 [1874]. Hepaticae in Hibernia mense Julii 1873 lectae. *Acta Societatis Scientiarum Fennicae* 10: 466–559.
- Schuster, R.M. 1992. The Hepaticae and Anthocerotae of North America. Volume V. NY: Columbia University Press.
- Timme, S.L. and P.L. Redfearn Jr. 2012. Checklist of the liverworts and hornworts of the Interior Highlands of North America in Arkansas, Illinois, Missouri, and Oklahoma [Online]. Available at: https://www.pittstate.edu/biology/files/documents/sperry-herbarium/ChecklistoftheLiverwortsandHornwortsoftheInteriorHighlandsofNorthAmerica_2012Jan.pdf (Accessed 25 July 2019).

New and Interesting Plant Records for the Central United States

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ABSTRACT. — Forty-three vascular plant species are newly reported for Kansas (36 species), Missouri (2), Nebraska (1), Oklahoma (1) and South Dakota (3). Reported new for Kansas are *Acer ginnala*, *A. platanoides*, *Adiantum capillus-veneris*, *Buddleja davidii*, *Carduus pycnocephalus* subsp. *pycnocephalus*, *Carex tetanica*, *C. tetrastachya*, *Cuphea carthagenensis*, *Cyclospermum leptophyllum*, *Cyperus flavescens*, *C. iria*, *C. retrorsus*, *Eleocharis cylindrica*, *Eriogonum flavum* var. *flavum*, *Erysimum cheiranthoides*, *Euonymus europaeus*, *Filipendula rubra*, *Heterotheca camporum* var. *glandulissimum*, *Hydrilla verticillata*, *Lysimachia clethroides*, *Mentzelia reverchonii*, *Neptunia lutea*, *Paulownia tomentosa*, *Pinus nigra*, *Pistacia chinensis*, *Prunus tomentosa*, *Quercus acutissima*, *Q. robur*, *Saccharum ravennae*, *Schoenoplectiella mucronata*, *Steinchisma hians*, *Styphnolobium japonicum*, *Tarenaya hassleriana*, *Torilis nodosa*, *Verbena bonariensis*, and *V. brasiliensis*; reported new for Missouri are *Penstemon calycosus* and *Phyllanthus urinaria* subsp. *urinaria*; reported new for Nebraska is *Celastrus orbiculatus*; reported new for Oklahoma is *Cerastium dubium*; and reported new for South Dakota are *Desmodium canescens*, *Eleocharis geniculata*, and *Helianthus hirsutus*. *Carex crawei* and *Mertensia virginica*, previously known in Kansas only from nineteenth century collections, are both reconfirmed for the state. New reports include 11 species considered native to the state in which they were discovered, and 32 non-natives. Recent additions to the flora of Kansas have included nearly twice as many exotic taxa as natives, with ornamental plants making up approximately half of the introduced species.

INTRODUCTION

Fieldwork and general collecting in the central United States since 2004 has yielded 43 species of vascular plants new for Kansas (36 records), Missouri (2 records), Nebraska (1 record), Oklahoma (1 record), and South Dakota (3 records). Species newly reported here include 11 species native to the state from which they are reported, and 32 non-natives (indicated by an asterisk). Two native species are reconfirmed for Kansas for the first time since they were originally collected in the state. Together, these records are enumerated below. Most specimens were collected as a part of continuing floristic studies of the Great Plains and the Midwest by the staff of the R.L. McGregor Herbarium, University of Kansas. In some instances, we report new occurrences documented by private collectors who have brought their discoveries to our attention. The primary set of voucher specimens is deposited in the R.L. McGregor Herbarium (KANU), University of Kansas, with a few duplicates deposited elsewhere as indicated.

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Including this report, recent publications of new records for Kansas have yielded 105 exotics and 67 native species (Barnard 2006; Freeman et al. 1998, 2003; Singhurst & Holmes 1998, 2005, 2017; Freeman 2000; Morse et al. 2007; Snow 2017, 2018; Singhurst et al. 2018; Haddock & Freeman 2019; Pryer et al. 2019). As the discovery of non-native species continues to outstrip native species, the percent of introduced taxa in the Kansas flora is now approaching 23%. About half of all exotics reported new for Kansas here and in earlier publications are species commonly cultivated for their ornamental value. Included among these are several species that have become invasive in the state, spreading rapidly into new sites; these include *Berberis thunbergii* DC., *Celastrus orbiculatus*, *Elaeagnus umbellata* Thunb., *Euonymus fortunei* (Turcz.) Hand.-Mazz., *E. alatus* (Thunb.) Siebold, *Ligustrum obtusifolium* Siebold & Zucc., and *Pyrus calleryana* Decne. (Freeman et al. 1998, 2003; Morse et al. 2007; Haddock & Freeman 2019; Pryer et al. 2019). Some other species included in previous reports were considered adventive in the state and have not been recollected since their initial discovery. Following the classification system proposed by Nesom (2000), these would be waifs. Fourteen non-native species presented here are also likely to be waifs (13 for Kansas, 1 for Missouri). Pending further field studies to assess their persistence in the flora, they are marked “(W)”.

SPECIES ACCOUNTS

**Acer ginnala* Maxim. (Sapindaceae). Amur maple, native to eastern Asia, is a widely cultivated ornamental shrub or small tree (Rehder 1927, Dirr 1998). It has been documented outside of cultivation at scattered localities in the eastern U.S. and southeastern Canada (Eilers & Roosa 1994, Rhoads & Block 2005, Weakley 2015, Wilhelm & Rericha 2017, USDA, NRCS 2019), including sporadic occurrences in eastern Missouri and Nebraska (Yatskievych 2006, Kaul et al. 2011). Haddock and Freeman (2019) reported the species from Kansas but did not cite vouchers. Here we provide voucher information for amur maple, which has been found at multiple localities in urban woodlots and wetlands.

Voucher specimens: **U.S.A. KANSAS:** DOUGLAS CO.: Lawrence, University of Kansas Main Campus, behind Grace Pearson Scholarship Hall, 7 Apr 2006, *C.A. Morse* 12670; 2.5 mi S, 3.25 mi W of jct. of US Hwy 59 and US Hwy 40 in Lawrence, along gravel road just E parking area for City of Lawrence off-leash dog area, 38.93°N, 95.329°W, 10 Oct 2008, *C.A. Morse* 18068; Lawrence, University of Kansas Campus West, just NW of intersection of Irving Hill Rd & Crestline Dr, 38.95°N, 95.27°W, 29 Jun 2008. *C.A. Morse* 17510; SE side of Lawrence, Lawrence Prairie Park, 38.93°N, 95.22°W, 9 Oct 2012, *C.A. Morse* 23795 & *H.S. Morse*; 16 May 2014, *C.A. Morse* 24162; Lawrence, University of Kansas Campus West, just SW of Bridwell Laboratory, 38.95°N, 95.26°W, 10 May 2013, *C.A. Morse* 23914; Lawrence, along Santa Fe RR right of way, just N of Lawrence City Hall and just E of N-bound bridge over Kansas River, 38.97°N, 95.23°W, 12 Apr 2019, *C.A. Morse* 26666. **SHAWNEE CO.:** Topeka, Warren Nature Area, W end

of wetland, 39.02°N, 95.72°W, 24 May 2011, *J. Hansen 402*; *J. Hansen 403*; 15 Apr 2012, *J. Hansen 463*.

**Acer platanoides* L. (Sapindaceae). Norway maple, native to Europe, has long been a popular shade tree in North America (Rehder 1927, Dirr 1998). There are numerous records of wild-collected plants from the northeastern and northwestern U.S. (Gleason & Cronquist 1991, Rhoads & Block 2005, Lesica 2012, Weakley 2015, Wilhelm & Rericha 2017), and southeastern and western Canada (Scoggan 1978, USDA, NRCS 2019). The species is considered invasive in eastern North America (Webster et al. 2006), but apparently no records exist from the central region of either the U.S. or Canada (see Yatskievych 2006; USDA, NRCS 2019). Haddock and Freeman (2019) reported Norway maple from Kansas but did not cite vouchers. Here we provide voucher information for the species, which has been found in woodlots and weedy, wooded ravines in urban areas. Norway maple is expected in other urban areas in the state.

Voucher specimens: U.S.A. KANSAS: DOUGLAS CO.: Lawrence, E side of University of Kansas Main Campus, weedy woodlots between Battenfeld Scholarship Hall & Lilac Ln on S side of 12 St, just E intersection with Oread Ave, 38.96°N, 95.24°W, 17 Apr 2006, *C.A. Morse 12674*; Lawrence, just SE of intersection of 10th and Indiana streets, weedy woodlot on steep slope along N side of Gertrude Sellars Pearson Residence Hall, 38.96°N, 95.24°W, 10 Aug 2007, *C.A. Morse s.n.*; 24 Apr 2008, *C.A. Morse 16394*; 7 Jun 2008, *C.A. Morse 16394b*; Lawrence, just NE of the Phi Gamma Delta fraternity, along footpath to Kappa Gamma sorority parking lot, 38.96°N, 95.24°W, 9 May 2013, *C.A. Morse 23912*; SE side of Baldwin City, just NE of Oakwood Cemetery, along W side of 3rd St, 38.77°N, 95.18°W, 15 Sep 2016, *C.A. Morse 25212 & L.F. Morse*; Lawrence, along Santa Fe RR right of way, just N of Lawrence City Hall and just E of N-bound bridge over Kansas River, 38.97°N, 95.23°W, 12 Apr 2019, *C.A. Morse 26665*.

Adiantum capillus-veneris L. (Pteridaceae). Common maidenhair fern is scattered throughout much of the southern U.S., mostly outside the Great Plains except for a disjunct population in the Black Hills of South Dakota (Great Plains Flora Association 1977, Brooks 1991). It is relatively widespread in the Ozarks in northern Arkansas, south-central Missouri, and eastern Oklahoma (Paris 1993). A small but thriving population was discovered in the northern Flint Hills of Kansas nearly 300 km north of the nearest known station in Oklahoma.

Voucher specimen: U.S.A. KANSAS: RILEY CO.: Konza Prairie Biological Station, Watershed K2A, rocky spring/seep area below limestone outcrop running into Kings Creek, 39°06.036'N, 96°34.427'W, 22 Jul 2013, *E. Allen, E.G. Towne, & D. Sumerour s.n.* (duplicate at KSC).

**Buddleja davidii* Franch. (Scrophulariaceae). Native to China, orange-eye butterfly bush is widely cultivated in the U.S. and has been reported as escaping from cultivation and occasionally

naturalized throughout the eastern U.S. (Rhoads & Block 2007, Tucker 2000, Yatskievych 2013, Weakley 2015) as well as along the west coast, and British Columbia and Ontario in Canada (Tallent-Halsell & Watt 2009). Orange-eye butterfly bush is considered invasive in some western states (Tallent-Halsell & Watt 2009). It was discovered in Kansas on the Johnson County Community College campus, presumably spreading by seed from cultivated plants. (W)

Voucher specimen: U.S.A. KANSAS: JOHNSON CO.: Overland Park, Johnson County Community College Campus, on N side of General Education Building, near loading dock, 38.92°N, 94.73°W, 29 Sep 2018, K.J. Morse s.n.

Carduus pycnocephalus* L. **subsp. pycnocephalus (Asteraceae). Italian thistle is an annual introduced from Europe. It has been reported from roughly a dozen states in the U.S. and is a range pest in much of California (Keil 2006). Italian thistle is reported in Kansas from a small population discovered in the southeast part of the state. (W)

Voucher specimen: U.S.A. KANSAS: MONTGOMERY CO.: ca 2 mi N Dearing, on downstream slope of older dam, 37.09°N, 95.71°W, 19 May 2014, B. Racy s.n.

Carex crawei Dewey (Cyperaceae). Crawe's sedge is broadly distributed across southern Canada and the northern U.S., although the species is reported to be uncommon throughout much of its range (Cochrane & Naczi 2002). The species was collected in Kansas by B.B. Smyth in 1897 (Hermann 1936, C.C. Freeman unpublished), but vouchers of Crawe's sedge reported by McGregor (1977) have been redetermined as other species. A recent series of collections from seeps in a tallgrass prairie hay meadow in northeast Kansas reconfirms the presence of this species in the state.

Voucher specimens: U.S.A. KANSAS: ATCHISON CO.: 2 mi E, 1 mi S Arrington, Chautauqua Rd and 222 Rd, 39°27'9.6"N, 95°29'48.0"W, 11 May 2017, J. Hansen 756; 14 May 2017, J. Hansen 759; 7 Jun 2017, J. Hansen 777.

Carex tetanica Schkuhr (Cyperaceae). Rigid sedge occurs widely throughout the northeastern and north-central U.S. and south-central Canada (Rothrock & Reznicek 2002). In the Great Plains, it occurs from southern Nebraska northward into the Canadian prairie provinces (Kaul et al. 2011, Rothrock & Reznicek 2002), where it is usually found in prairie swales and calcareous seeps and fens. The species was documented for the first time in northeast Kansas in a series of small, graminoid-dominated seeps.

Voucher specimen: U.S.A. KANSAS: JACKSON CO.: 4 mi N, 1.5 mi E of jct. of US Hwy 75 & KS Hwy 16 in Holton, 39.52°N, 95.72°W, 27 May 2014, C.A. Morse 24166 & F.J. Norman.

Carex tetrastachya Britton (Cyperaceae). Britton's sedge has been documented from Louisiana, Oklahoma, and Texas (Mastrogiuseppe et al. 2002). A population of scattered plants discovered in a weedy, periodically inundated wetland complex along a floodway in south-central Kansas extends the range of the species approximately 80 km northward.

Voucher specimen: U.S.A. KANSAS: SEDGWICK CO.: SW side of Wichita, along E side of Wichita Valley Center Floodway, N of MacArthur Ave overpass (near "Oatville"), 37.62°N, 97.40°W, 18 Jun 2009, C.A. Morse 19176 (duplicate at MICH).

****Celastrus orbiculatus*** Thunb. (Celastraceae). Oriental bittersweet, native to Asia, has been documented from roughly 30 states and provinces in the eastern U.S. and southeastern Canada (USDA, NRCS 2019). The species is considered invasive throughout much of eastern North America (Webster et al. 2006) and is listed as noxious or invasive in seven states (USDA, NRCS 2019). It has been documented in scattered counties in Iowa (Eilers & Roosa 1994), Kansas (Haddock & Freeman 2019, Pryer et al. 2019), and Missouri (Yatskievych 2006). Kaul et al. (2011) anticipated its eventual arrival in Nebraska, which we here confirm.

Voucher specimens: U.S.A. NEBRASKA: NEMAHA CO.: ca 3.75 mi N, 1 mi E of Barada, Indian Cave State Park, along road just S and W of St. Deroin townsite, 40.27°N, 95.56°W, 20 Sep 2015, C.A. Morse 24835 et al. RICHARDSON CO.: 3 mi N, 0.25 mi E of Barada, Indian Cave State Park, tent camping area along E side of NE Hwy 64F just N of turnoff to Ash Grove and Hackberry Hollow campgrounds, 40.26°N, 95.57°W, 20 Sep 2015, C.A. Morse 24831 et al.

****Cerastium dubium*** (Bastard) Guépin (Caryophyllaceae). Doubtful chickweed is an introduced annual, native to southern Europe and Asia, that has been documented in widely scattered sites in nearly a dozen states in the U.S. since it was first collected in 1966 (Morton 2005, Turner & Davidse 2017). The only report from the Great Plains is from Labette County, Kansas (Morse et al. 2007). The first Oklahoma record of this species comes from a single population discovered in disturbed soil of a parking area, where plants were locally abundant.

Voucher specimen: U.S.A. OKLAHOMA: KAY CO.: Ponca City, W side of town, 101 Rodeo Arena, SW of intersection of Prospect & Ash, 36.74°N, 97.09°W, 1 May 2013, C.C. Freeman 24465.

****Cuphea carthagenensis*** (Jacq.) J.F. Macbr. (Lythraceae). Native to South America, Colombian waxweed is widely established throughout the southeast coastal plain of the U.S., as well as in Mexico and the Pacific Islands (Graham 1975). The species was first documented in the U.S. in 1923 in North Carolina; it has become increasingly common since about 1950 (Graham 1975). It was discovered in Kansas in cultivated beds on the University of Kansas campus, presumably a contaminant in bedding plants or mulch. (W)

Voucher specimen: U.S.A. KANSAS: DOUGLAS CO.: Lawrence, University of Kansas Main Campus, just W of plaza between Integrated Science Building and Burge Union, 38.96°N, 95.26°W, 27 Jul 2018, 26 Sep 2019, C.A. Morse 27049.

**Cyclospermum leptophyllum* (Pers.) Sprague ex Britton & P. Wilson (Apiaceae). Native to South America, marsh parsley is a widely distributed weed throughout the southern U.S. and in temperate and tropical areas worldwide (She & Watson 2005, USDA, NRCS 2019). The first Kansas record of this species comes from a population discovered in disturbed soil of a weedy planting. (W)

Voucher specimen: U.S.A. KANSAS: JOHNSON CO.: Overland Park, Johnson County Community College Campus, NE part of campus, 38.92°N, 94.73°W, 10 Jul 2019, C.A. Morse 26840 & H.S. Morse.

**Cyperus flavescens* L. (Cyperaceae). Yellow flatsedge is broadly distributed throughout the eastern U.S. and southeast Canada, and is also known from California and the West Indies, as well as South America, Africa, and Eurasia (Tucker et al. 2002). The species has been reported in previous publications on the flora of Kansas (Smyth 1898, Great Plains Flora Association 1977, McGregor 1977) based on misidentified specimens of *Cyperus bipartitus* Torr. (Kolstad 1991; C.C. Freeman unpublished data; R.F. Naczi pers. comm.). Yellow flatsedge was again reported for Kansas by Tucker et al. (2002); however, as no verified specimens appeared to exist, we conclude that this attribution was also based on erroneous early publications. A large population of *C. flavescens* was recently discovered in northeast Kansas, where it appears to have been introduced as a seed contaminant in turf grass. Although native in the U.S., the Kansas occurrence is clearly a recent introduction and the species is therefore considered non-native in the state.

Voucher specimen: U.S.A. KANSAS: DOUGLAS CO.: Lawrence, along S side of bike-hike trail, just W of S end of Naismith Valley Park, 38.93°N, 95.25°W, 4 Oct 2019, C.A. Morse 27056.

**Cyperus iria* L. (Cyperaceae). Ricefield flatsedge has been reported from a number of states in the eastern U.S. and California (Tucker et al. 2002). Native to tropical Asia, the species appears to be well established in the lower Mississippi River drainage and along the Gulf and Atlantic coasts northward to southern New England (Tucker 1987, Tucker et al. 2002). It was first discovered in Kansas growing in grass-permeable paving installed at an urban nature center, and subsequently has appeared in cultivated beds around the University of Kansas campus, growing with a variety of graminoids and weedy annuals. Where observed, the species has persisted through at least two growing seasons and spreads readily by seed.

Voucher specimens: U.S.A. KANSAS: DOUGLAS CO.: Lawrence, University of Kansas Main Campus, just W of plaza between Integrated Science Building and Burge Union, 38.96°N, 95.26°W, 27 Jul 2018, C.A. Morse 26371; 24 Sep 2018,

C.A. Morse 26371A; 26 Sep 2019, *C.A. Morse 27053*; SE side of Lawrence. Lawrence Prairie Park, 38.93°N, 95.22°W, 24 Aug 2013, *C.A. Morse 23972 et al.*; 25 Oct 2019, *C.A. Morse 23975b*; Lawrence, University of Kansas West Campus, SW end of Crowell Ave between Bridwell Laboratory and Foley Center, 38.94°N, 95.26°W, 9 Sep 2019, *C.C. Freeman 27625*.

**Cyperus retrorsus* Champ. (Cyperaceae). Pine barren flatsedge is broadly distributed throughout the southeastern U.S. It occurs northward to New York and west to Oklahoma and Texas (Tucker et al. 2002). It was discovered in Kansas in cultivated beds on the University of Kansas campus, presumably a contaminant in bedding plants or mulch. (W)

Voucher specimen: U.S.A. KANSAS: DOUGLAS CO.: Lawrence, University of Kansas Main Campus, just W of plaza between Integrated Science Building and Burge Union, 38.96°N, 95.26°W, 27 Jul 2018, 26 Sep 2019, C.A. Morse 27055.

Desmodium canescens (L.) DC. (Fabaceae). Hoary tick-clover occurs in forest, prairies, meadows, and roadsides throughout the eastern U.S. and southeastern Canada (Isley 1998). It is relatively common in the southeastern Great Plains, occurring northward along the Missouri River and its immediate tributaries in northeast Nebraska and northwest Iowa (Great Plains Flora Association 1977, Kaul et al. 2011). A collection from Clay County near the southeast corner of South Dakota confirms the occurrence of hoary tick-clover in that state.

Voucher specimen: U.S.A. SOUTH DAKOTA: CLAY CO.: 1 mi S, Hwy 19, North Alabama Bend, 42°46'7.3"N, 96°57'42.9"W, 27 Aug 2015, J. Hansen 617.

Eleocharis cylindrica Buckley (Cyperaceae). Based on herbarium records, cylinder spikerush is exceedingly rare in North America, having been documented from a handful of sites in Texas (Turner et al. 2003b); it also occurs in Argentina and Paraguay (Smith et al. 2002). A population of cylinder spikerush was discovered in a saline wetland complex in southern Kansas, where it was locally abundant in wet depressions.

Voucher specimen: U.S.A. KANSAS: SUMNER CO.: 6.5 mi S, 4.25 mi E of Dalton, Slate Creek Wildlife Area, SE part along N side of E 80th St, 37.17°N, 97.20°W, 11 Jun 2008, C.A. Morse 17396 (duplicate at WIS).

Eleocharis geniculata (L.) Roem. & Schult. (Cyperaceae). Canada spikerush occurs primarily in the southern U.S. from California east to South Carolina, but is also disjunct in counties around the Great Lakes, and in Ontario and British Columbia, Canada (Voss 1972, Argus & White 1982, Swink & Wilhelm 1994, Smith et al. 2002). It is rare in the southern Great Plains, with populations documented in northeastern Texas, central Oklahoma, south-central Kansas (USDA, NRCS 2019), and one occurrence in Merrick County, Nebraska (Kaul et al. 2011). A collection from extreme

southeastern South Dakota extends the documented range in the central U.S. northeastward by approximately 200 km.

Voucher specimen: U.S.A. SOUTH DAKOTA: CLAY CO.: Vermillion, 1 mi S, Hwy 19, North Alabama Bend, along shore of the Missouri River, 42°45'35.6"N, 96°58'3.4"W, 8 Sep 2015, J. Hansen 631.

Eriogonum flavum* Nutt. var. *flavum (Polygonaceae). Alpine golden wild-buckwheat is broadly distributed through the western Great Plains and parts of the central Rocky Mountains in shortgrass prairie, sagebrush steppe, and lower montane woodlands from Colorado north into the prairie provinces of Canada (Reveal 2005). The species is well documented in central Colorado and Nebraska panhandle (Ackerfield 2015, Kaul et al. 2011). A single collection from Kansas near the Colorado border extends the range of alpine golden wild-buckwheat approximately 130 km southeast, where it was found in mixed-grass prairie uplands above the Arikaree River.

Voucher specimen: U.S.A. KANSAS: CHEYENNE CO.: 26.6 air km NW of Saint Francis, Devils Gap along Cheyenne County Rd 2, 39.94°N, 102.03°W, 13 Aug 2016, V. Smith 9.

****Erysimum cheiranthoides* L.** (Brassicaceae). Wormseed wallflower is an annual with a circumboreal distribution, ranging widely through Canada and the U.S. (USDA, NRCS 2019). The species is well documented in the northern Great Plains as far south as central Nebraska (Great Plains Flora Association 1977, Barker 1991, Kaul et al. 2011), but is uncommon in Iowa and known from a few scattered occurrences in Missouri (Eilers & Roosa 1994, Yatskievych 2006). The first Kansas record of this species comes from a small population found at the edge of a woodland. (W)

Voucher specimen: U.S.A. KANSAS: JACKSON CO.: 2 mi SW of Larkinburg, 39.45°N, 95.62°W, 11 Jun 2012, J. Hansen 482.

****Euonymus europaeus* L.** (Celastraceae). European spindletree is occasionally planted as an ornamental shrub or small tree in parts of the U.S. and Canada (Rehder 1927, Dirr 1998). It establishes outside of cultivation, especially in urban woodlots, second-growth forests, and along stream and river floodplains, and has been reported as naturalized throughout the eastern U.S. and southeast Canada, as well as in Utah (Gleason & Cronquist 1991, Ma & Levin 2016). Haddock and Freeman (2019) reported European spindletree from Kansas but did not cite vouchers, which we cite here. The Kansas population is well-established and associated with *Euonymus alatus*, *E. fortunei*, *Lonicera maackii* (Rupr.) Herder, and *L. japonica* Thunb.

Voucher specimens: U.S.A. KANSAS: DOUGLAS CO.: Lawrence, City of Lawrence Brook Creek Park, just NE of 1200 block of Prospect Ave, 38.96°N, 95.22°W, 17 May 2008, C.A. Morse 16487; 12 Oct 2008, C.A. Morse 18070 & K.

Logan; 10 Oct 2012, C.A. Morse 23800 & H.S. Morse; 21 Oct 2015, C.A. Morse s.n.; 20 Nov 2019, C.A. Morse 27059.

Filipendula rubra (Hill) B.L. Rob. (Rosaceae). Queen-of-the-prairie is an herbaceous perennial native to the northeast U.S. and southeast Canada (Gleason & Cronquist 1991) and a popular ornamental outside its native range. The species is known from fens in southern Missouri and eastern Iowa (Eilers & Roosa 1994, Yatskievych 2013), where it is reported to be rare. A collection from a degraded fen in northeast Kansas extends the range of this species approximately 220 km northwest from the nearest populations in Missouri.

Voucher specimen: **U.S.A. KANSAS:** ATCHISON CO.: 1.5 mi S Muscotah, Muscotah Marsh, 39°31'40.9"N, 95°30'59.1"W, 29 Jul 2016, J. Hansen 683.

Helianthus hirsutus Raf. (Asteraceae). Hairy sunflower occurs widely in the eastern U.S. and southeastern Canada (Schilling 2006). It is a common species in mesic to xeric woodlands and forests along the eastern edge of the Great Plains in western Minnesota, western Iowa, and eastern Nebraska, Kansas, and Oklahoma (Great Plains Flora Association 1977, Barkley 1991). It was heretofore unknown in South Dakota, although it has been documented in multiple counties in western Iowa and eastern Nebraska (Great Plains Flora Association 1977, Kaul et al. 2011). We report here the first record of *Helianthus hirsutus* from South Dakota.

Voucher specimen: **U.S.A. SOUTH DAKOTA:** LINCOLN CO.: Fairview, 4 mi W, Newton Hills State Park, 43.22°N, 96.57°W, 23 Aug 2012, J. Hansen 501.

****Heterotheca camporum*** (Greene) Shinnars var. ***glandulissimum*** Semple (Asteraceae). Lemon-yellow false golden-aster is found in a wide variety of open and wooded habitats, including disturbed fields and roadsides, in the east-central United States (Semple 1996). Populations were known only from Illinois, western Indiana, and eastern Missouri prior to 1925, but the species has undergone a significant range expansion in the past 100 years, especially in the eastern U.S. (Semple 1983, 1996). A collection from extreme eastern Kansas, presumably introduced, is the westernmost station for the species.

Voucher specimen: **U.S.A. KANSAS:** JOHNSON CO.: Spring Hill, W side of large lake at Rockwood Falls Estates, 191st and Flint, 38.78°N, 94.72°W, 16 Nov 2011, J. Hansen 631.

****Hydrilla verticillata*** (L.f.) Royle (Hydrocharitaceae). Native to the Old World, waterthyme is a federally listed noxious weed in the U.S. now reported from a number of states in the northeast, southeast, and along the west coast (Haynes 2000, USDA, NRCS 2019). The first Kansas record of this species comes from a population in a pond in the northeast part of the state. Efforts to eradicate waterthyme at that site are ongoing (Scott Marsh, pers. comm.). (W)

Voucher specimens: **U.S.A. KANSAS:** JOHNSON CO.: Olathe, 151st St and Mullen St, Black Bob Pond, 38.86°N, 94.75°W, 4 Sep 2008, *L. Ramonda s.n.*; 7 Sep 2008, *J. Vogel s.n.*

**Lysimachia clethroides* Duby (Primulaceae). Native to eastern Asia, gooseneck loosestrife is a perennial herb grown as a garden ornamental (Cholewa 2009). Plants growing outside of cultivation have been reported from a dozen states in the eastern U.S. and the province of Quebec, Canada (Cholewa 2009). Two localized colonies were discovered in a county park in northeast Kansas in areas with no evidence of dwellings or cultivation.

Voucher specimens: **U.S.A. KANSAS:** JOHNSON CO.: Lenexa, W side of town in Shawnee Mission Park, SW side ca 1.5 mi WSW of Johnson County Parks and Recreation District Headquarters, due N of dog exercise area, oak-hickory forest on S side of Shawnee Mission Lake and South Shore Lake Trail, 38.98°N, 94.80°W, 21 Oct 2010, *C.C. Freeman 23976*; Lenexa, W side of town in Shawnee Mission Park, SW side ca 1 mi WSW of Johnson County Parks and Recreation District Headquarters, oak-hickory forest on N- and NE-facing slopes along South Shore Lake Trail above creek, 38.98°N, 94.79°W, 26 Oct 2010, *C.C. Freeman 23984*.

Mentzelia reverchonii (Urb. & Gilg) H.J. Thomps. & Zavort. (Loasaceae). Reverchon's mentzelia occurs in southeastern Colorado, eastern New Mexico, central and western Texas, and northern Mexico (Turner et al. 2003a, Allred & Ivey 2012, Ackerfield 2015, Schenk & Hufford 2016). It also has been reported from southwestern Oklahoma (Kaul 1991). McGregor et al. (1976), citing the lack of specimen evidence, excluded it from the Kansas flora. A small population in far west-central Kansas confirms its occurrence in the state.

Voucher specimen: **U.S.A. KANSAS:** LOGAN CO.: ca 10 mi SSW of Russell Springs, diverse High Plains sand prairie on W- and NW-facing upper slope of canyon rim, Ogallala Formation, 38.78°N, 101.25°W, 4 Sep 2015, *V. Smith s.n.*

Mertensia virginica (L.) Pers. ex Link (Boraginaceae). Widely distributed through northeastern North America (Gleason & Cronquist 1991), Virginia bluebells was reported by Carruth (1880) for Kansas, based on material sent to him from the town of Paola in Miami County, by J.H. Oyster. The species was collected at least twice more by Oyster in the 1880s (Williams 1927). The absence of subsequent observations led McGregor (1977) to postulate that *M. virginica* had been extirpated from the state. The presence of Virginia bluebells in Kansas is reconfirmed, based on collections from two large populations discovered in rich hardwood forests in the flood plains of North Sugar Creek and Middle Creek in southeastern Miami County.

Voucher specimens: **U.S.A. KANSAS:** MIAMI CO.: 0.5–1 mi N, 2.5 mi E Jingo, North La Cygne State Fishing Lake and Wildlife Area, 38.42°N, 94.65°W, 17 May

2005, Morse 11269 & Salisbury; 26 May 2005, Morse 11288; 3 Apr 2006, Roth & Salisbury s.n.; ca. 1.6 mi S, 2 mi W of New Lancaster, just SE of the intersection of Somerset Rd and 379th St, 38.44°N, 94.77°W, 23 Apr 2018, G. Tegtmeier s.n.; 16 Apr 2019, G. Tegtmeier & M. Kowalski s.n.; 23 Apr 2019, C.A. Morse 26671 et al.

****Neptunia lutea*** (Leavenw.) Benth. (Fabaceae). Yellow puff is a perennial herb native to the south-central U.S., with occurrences in Alabama, Arkansas, Louisiana, Mississippi, Oklahoma, and Texas (Isley 1998). The first Kansas record of this species comes from a native prairie in Saline County, roughly 300 km north of the nearest population in north-central Oklahoma. There is no evidence that the species was purposely introduced at the site (Kenneth Warren, pers. comm.), but the fact that the prairie is part of an active research site, where perennial agriculture is studied, and the large range disjunction suggest the species was introduced. (W)

Voucher specimen: U.S.A. KANSAS: SALINE CO.: Salina, East Water Well Rd 1.5 mi E of jct. of East Water Well Rd and South Ohio St, The Land Institute, 38.46°N, 97.34°W, 21 Jun 2006, K. Warren s.n..

****Paulownia tomentosa*** (Thunb.) Steud. (Paulowniaceae). Native to eastern Asia, princess tree is a widely cultivated ornamental that has been introduced throughout much of the eastern U.S. and in Washington (Rehder 1927, Correll & Johnston 1970, Gleason & Cronquist 1991, Rhodes & Block 2007, Yatskievych 2013, Weakley 2015, USDA, NRCS 2019). A single, small, fertile population on a steep slope along the Missouri River in northeast Kansas establishes the presence of princess tree in the state.

Voucher specimen: U.S.A. KANSAS: ATCHISON CO.: Atchison, E side of town along River Road, 850 m NNE of intersection with Atchison St, 39.57°N, 95.11°W, 22 Jul 2018, C.C. Freeman 27265 & J.A. Freeman.

Penstemon calycosus Small (Plantaginaceae). Long-sepal beardtongue is a native perennial found in woodlands, meadows, bluffs, and clearings on rocky slopes. Populations are concentrated in the Ohio River drainage, east of the Mississippi River, with populations in New England possibly the result of introductions (Pennell 1935). Steyermark (1977) excluded *P. calycosus* from the Missouri flora based on misidentified specimens of *P. digitalis*. Freeman (2019) included Missouri in the species' range based on a series of collections from two southeastern counties along the Missouri River. Vouchers from those populations are cited here.

Voucher specimens: U.S.A. MISSOURI: CAPE GIRARDEAU CO.: 7.2 air km SSW Neelys along Girardeau County Road V, 37.44°N, 89.51°W, 10 Jun 2016, C.C. Freeman 25910; 5.7 air km W Jackson along MO 72, 37.38°N, 89.72°W, 11 Jun 2016, C.C. Freeman 25911. PERRY CO.: 1.6 air km S McBride along MO 51, ca 30 m S of jct. with Perry County Road 210, 37.82°N, 89.84°W, 10 Jun 2016,

C.C. Freeman 25904; 3.1 mi air km SW Frohna along Perry County Road A, 37.92°N, 89.65°W, 10 Jun 2016, *C.C. Freeman 25908*.

****Phyllanthus urinaria* L. subsp. *urinaria*** (Phyllanthaceae). A diminutive annual native to Asia, chamber bitter is a weed in tropical regions around the world (Webster 1970), which was first observed in the U.S. in 1944. The species now occurs primarily in states along the Gulf of Mexico and has been documented in the southern Mississippi River drainage northward to Jackson County, Illinois (Mohlenbrock 1986). The species was reported for Kansas by Freeman et al. (2003), and here we report it for the first time from Missouri, where it was discovered growing in mulch in an urban parking lot in St. Louis. (W)

Voucher specimen: U.S.A. MISSOURI: ST. LOUIS CO.: St. Louis, S part of city near parking lot at NW corner of Shaw Blvd and South Vandeventer Ave, N of the Monsanto Building (Missouri Botanical Garden), 38.62°N, 90.26°W, 11 Oct 2014, C.C. Freeman 25357 & R.K. Rabeler.

****Pinus nigra* Arnold** (Pinaceae). Austrian pine is widely cultivated throughout the eastern U.S. (Rehder 1927, Dirr 1998). In the Great Plains, it is commonly planted along roadsides and in shelterbelts. Austrian pine has naturalized in St. Louis County, Missouri (Yatskievych 1999), and there are sporadic reports of it occurring spontaneously elsewhere in the eastern U.S. and southern Canada (Catling 2005, Kral 1993, Swink & Wilhelm 1994, Weakley 2015, USDA, NRCS 2019), although the species has not been observed to escape cultivation in Nebraska (Kaul et al. 2011). Haddock and Freeman (2019) reported Austrian pine from Kansas without citing vouchers. Here we cite voucher for populations in three counties, where it is spreading by seed from cultivation.

Voucher specimens: U.S.A. KANSAS: DOUGLAS CO.: 1 mi N, 2 mi W of Stull, along N 1700 Rd, just W of intersection with E50 Rd, 38.99°N, 95.49°W, 6 Mar 2019, C.A. Morse 26623. ELLSWORTH CO.: ca 5 mi S, 2 mi E of Carneiro, Kanopolis State Park, Horsethief Area, Horsethief Rd, just S of sharp turn W to Buffalo Track Canyon Nature Trail Head, 38.66°N, 97.99°W, 24 Mar 2018, C.A. Morse 26241 et al.; ca 9 mi S, 2.5 mi E of Carneiro, Kanopolis State Park, Langley Point area, just W of boat ramp, 38.61°N, 97.98°W, 24 Mar 2018, C.A. Morse 26258 et al. JOHNSON CO.: 2 mi W of Clearview City, along S side of E-bound KS Hwy 10, just W of Evening Star Rd exit, at mile marker 14, 38.94°N, 95.05°W, 9 Sep 2016, C.A. Morse 25203.

****Pistacia chinensis* Bunge** (Anacardiaceae). Native to eastern Asia, Chinese pistache is an urban shade tree widely planted through the southern U.S. and popular for its colorful fall foliage (Rehder 1927, Dirr 1998). It has been documented from scattered localities in Alabama, Arizona, Arkansas, California, Georgia, Mississippi, North Carolina, Oklahoma, and Texas (Krings 2011, USDA, NRCS 2019). Nesom (2009) included Chinese pistache on his watch list of non-native Texas plants. Also grown as a shade tree in south-central Kansas, Chinese pistache has been documented

establishing outside of cultivation in sandy, second-growth forests, hedgerows, and woodlots in the city of Wichita, Kansas. It was reported from Kansas by Haddock and Freeman (2019) but without voucher information. We here provide that information.

Voucher specimens: **U.S.A. KANSAS:** SEDGWICK CO.: Wichita, Sim Memorial Park, along W Sim Park Dr, just W of Botanica, 37.70°N, 97.37°W, 27 Oct 2012, C.A. Morse 23827 & H.S. Morse; Wichita, SE side of town, ca 300 m NW of jct. North Rock Rd and East Pawnee St, 37.66°N, 97.25°W, 8 Sep 2018, C.C. Freeman 27315 & J.A. Freeman; Wichita, NE side of town, ca 80 m SW of jct. Gouverneur St and East 29th St North, 37.73°N, 97.25°W, 8 Sep 2018, C.C. Freeman 27321 & J.A. Freeman.

****Prunus tomentosa*** Thunb. (Rosaceae). Nanking cherry, a shrub native to eastern Asia, is widely cultivated as an ornamental and for its edible fruit (Rehder 1927, Dirr 1998); the fruits are reportedly readily consumed by birds (Kaul et al. 2011). The species is occasionally reported as an escape and has been documented from a handful of states in the northern U.S. and the provinces of Ontario and Saskatchewan, Canada (Rhoads & Block 2007, Kaul et al. 2011, Weakley 2015, Wilhelm & Rericha 2017, USDA, NRCS 2019). The first Kansas records of this species come from a disturbed oak-hickory forest and urban woodlots, where plants apparently established from seeds dispersed from nearby planted shrubs. (W)

Voucher specimens: **U.S.A. KANSAS:** DOUGLAS CO.: Lawrence, University of Kansas Main Campus, behind Grace Pearson Scholarship Hall, 38.95°N, 95.24°W, 23 May 2004, C.A. Morse 10516; 7 Apr 2006, C.A. Morse 12669; 10 Apr 2008, C.A. Morse s.n.; 9 Jun 2008, C.A. Morse s.n.; Lawrence, SW corner of intersection of 13th and Louisiana streets, 38.96°N, 95.24°W, 5 Nov 2008, C.A. Morse 18134; Lawrence, ca 1 mi W of town, Overlook Park on N side of Clinton Reservoir, 38.94°N, 95.34°W, 31 Mar 2018, C.C. Freeman 26869 & J.A. Freeman.

****Quercus acutissima*** Carruthers (Fagaceae). Native to eastern Asia, sawtooth oak is widely planted in the eastern U.S. as a shade tree and wildlife food source (Dirr 1998, Whittemore 2004). Whittemore (2004) reported plants growing outside of cultivation in seven states and the District of Columbia. Wild plants of sawtooth oak were recently discovered in disturbed areas and second growth forests in eastern Kansas where they apparently established from acorns dispersed from nearby planted trees. Haddock and Freeman (2019) reported sawtooth oak from Kansas without voucher citations, which we provide here.

Voucher specimens: **U.S.A. KANSAS:** DOUGLAS CO.: Lawrence, SE side, Lawrence Prairie Park, 38.93°N, 95.21–95.22°W, 20 Oct 2012, C.A. Morse 23804, K.J. Morse & H.S. Morse; Lawrence, parking area on E side of Lawrence Union Pacific Depot, 38.98°N, 95.23°W, 7 Jun 2014, C.A. Morse 24179.

****Quercus robur*** L. (Fagaceae). English oak is among the most widely planted oaks in temperate and subtropical regions of the world (Nixon & Muller 1997). Plants growing outside of cultivation have been reported in the northeastern and northwestern U.S., and in southeastern and southwestern Canada (Nixon & Muller 1997), as well as in the Chicago region (Wilhelm & Rericha 2017). English oak has been found growing in weedy woodlots and plantings in eastern Kansas, where it has spread from nearby cultivated individuals. It was reported for Kansas by Haddock and Freeman (2019) without voucher citations, which we provide here.

Voucher specimens: **U.S.A. KANSAS:** DOUGLAS CO.: Lawrence, parking lot complex in 800 block between Massachusetts and Vermont streets, 38.97°N, 95.24°W, 13 Sep 2007, *C.A. Morse s.n.*; Lawrence, University of Kansas Campus West: just S of SW corner of Bob Billings Pkwy and Crestline Dr., 38.96°N, 95.27°W, 5 Aug 2010, *C.A. Morse 21491*.

****Saccharum ravennae*** (L.) L. (= *Erianthus ravennae* (L.) Beauv.) (Poaceae). Ravenna grass, a perennial ornamental native to the Mediterranean region and western Asia, was reported by McGregor et al. (1976) as a non-naturalized alien rarely escaping cultivation in Kansas. The species was known at that time from collections made in Harvey and Wyandotte counties (both 1975). Ravenna grass was not considered an established part of the Great Plains flora by Sutherland (1991) and was considered only a casual escape in North America by Webster (2003). However, the species has been reported as escaped or established in at least 22 states and the District of Columbia (Vincent & Gardner 2016), including Missouri, where Yatskievych (1999) suggested it is likely under-represented in collections, and Oklahoma, where it has become well established along riparian corridors (Burgess & Hoagland 2006). Ravenna grass is considered potentially invasive, invasive, or a noxious weed in several states, including Texas (Singhurst et al. 2010, Vincent & Gardner 2016). During the past four decades, *S. ravennae* has also become well established in the Kansas flora.

Voucher specimens: **U.S.A. KANSAS:** ANDERSON CO.: 0.5 mi N, 0.5 mi W of Garnett, just N of KS 31, 26 Aug 1998, *C.C. Freeman 11805 & P. Liechti*. DOUGLAS CO.: Lawrence, W side of town, vacant lot ca 40 m SW of intersection of Research Park Road and Research Parkway along S side of Research Parkway, 38.96°N, 95.31°W, 2 Sep 2013, *C.C. Freeman 24824 & J.A. Freeman*; Lawrence, 7.3 km W along E 900 Road, due N of the Clinton Reservoir Dam, 38.94°N, 95.33°W, 2 Sep 2013, *C.C. Freeman 24825 & J.A. Freeman*; Lecompton, E side of town, 39.30°N, 95.39°W, 11 Sep 2014, *C.C. Freeman 25249*. GEARY CO.: Junction City, SW side of town immediately W of jct. of I-25 & US 77, 25 Aug 1998, *C.C. Freeman 11803 & P. Liechti*; Junction City, N edge of town, Fort Riley Military Reservation, Training Unit 25, Riverwalk Trail, 39°02'51", 96°50'00", 19 Sep 2002, *C.C. Freeman 19508*. HARVEY CO.: 2 mi NE Newton, 1 Sep 1975, *S. Stephens 87839*; E edge of Newton, 10 Oct 1975, *R.L. McGregor 28732*. JOHNSON CO.: 1.5 mi S, 5 mi E DeSoto, Cedar Creek Parkway, N of KS 10,

38.95°N, 94.88°W, 27 Sep 2006, *C.C. Freeman 21948*; Overland Park, Indian Creek Bike and Hike Trail, between intersection of W 115th St and Indian Creek Pkwy (on N) and intersection of Bluejacket and Indian Creek Pkwy (on S), 38.92°N, 94.71°W, *C.A. Morse 24043 et al.*; Olathe, NW side of town, Ernie Miller Nature Center along KS 7, 38.89°N, 94.84°W, 24 Sep 2014, *C.C. Freeman 25273*. NEOSHO CO.: ca 3+ mi SE of St. Paul, Mission Twp, 23 Aug 1998, *W.W. Holland 9498*; 5 mi S, 2 mi W, 0.25 mi S of Erie, Centerville Twp, 25 Sep 2000, *W.W. Holland 9992*. SHAWNEE CO.: Topeka, Big Shunga Park, W side, 39°01'02.2"N, 95°43'12.1"W, 18 Nov 2010, *J. Hansen 388*. WYANDOTTE CO.: 0.5 mi E of Turner exit on I-70, 13 Oct 1975, *R.E. Brooks 11862*.

****Schoenoplectiella mucronata* (L.) J. Jung & H. K. Choi (= *Schoenoplectus mucronatus* (L.) Palla)** (Cyperaceae). Bog bulrush is an economically important weed of rice fields in California; it also has been documented from widely scattered sites in the Pacific Northwest, Midwest, Mid-Atlantic, and New England (Smith 2002, Lamont et al. 2011). Initially discovered in Kansas in 2012, *S. mucronata* is now known from six counties in the northeast part of the state. Typically it is found growing along the muddy margins of impoundments, usually occurring with various species of *Carex*, *Eleocharis*, *Juncus*, and *Schoenoplectus*.

Voucher specimens: **U.S.A. KANSAS**: DOUGLAS CO.: SE edge of Lawrence, Baker Wetlands, N end of restoration site, S of 31st St and W of Louisiana St, 38.92°N, 95.24°W, elev 820 ft, 2 Aug 2012, *M. Piva & R. Boyd s.n.* (duplicate at Hb. Baker University); SE edge of Lawrence, Baker University Wetlands, N edge of Ibis Swale, along S side of N 1250 Rd, 38.92°N, 95.22°W, 26 Oct 2019, *C.A. Morse 27058*. JACKSON CO.: Holton, 5.5 air km SW, small farm pond along upper reaches of Bills Creek, 39.43°N, 95.78°W, 2 Aug 2016, *C.C. Freeman 26142*; Holton, 9.2 air km NNW, farm pond in native rangeland along upper reaches of tributary to Straight Creek, 39.54°N, 95.78°W, 2 Aug 2016, *C.C. Freeman 26157*. JEFFERSON CO.: ca 1.5 mi S, 7.5 mi E of Williamstown, University of Kansas Ecological Reserves: Nelson Environmental Study Area and Rockefeller Experimental Tract: unit 5031 (including adjoining portions of units 5030 and 5502), artificial ponds down slope from (S of) the Armitage Education Center, 39.05°N, 95.19°W, 20 Jun 2012, *C.A. Morse 23767*; ca 1.25 mi S, 7.75 mi E of Williamstown, University of Kansas Ecological Reserves, Nelson Environmental Study Area and Rockefeller Experimental Tract: unit 5501, NE arm of Storage 4 pond, 39.05°N, 95.19°W, 22 Jun 2012, *C.A. Morse 23769*. JOHNSON CO.: just W of De Soto, Johnson County Park & Recreation District Lexington Lake Park, along W side of Lexington Lake, 38.97°N, 95.01°W, 21 Aug 2018, *C.A. Morse 26403 & P. Showalter*. LEAVENWORTH CO.: ca 1 mi S, 8 mi E of Williamstown, University of Kansas Ecological Reserves: Nelson Environmental Study Area and Rockefeller Experimental Tract: unit 7020, Frank B. Cross Reservoir, 39.05°N, 95.18°W, 22 Jun 2012, *C.A. Morse 23771*.

POTTAWATOMIE CO.: 1 mi W Belvue, Camp Creek Road Wetland, W side of the road, 39°12'45.1"N, 96°12'12.2"W, 16 Sep 2017, *J. Hansen* 830; 1 mi E St. Marys, St. Marys Wetland, S side of Hwy 24, 39°10'48"N, 96°2'9.8"W, 16 Sep 2017, *J. Hansen* 838.

**Steinchisma hians* (Elliott) Nash (Poaceae). Gaping grass is a native perennial found in open, mesic to hydric sites throughout much of the southeastern U.S., approaching the Kansas border in northwestern Arkansas and northeastern Oklahoma (Freckmann & Lelong 2003). A population was discovered in extreme southeastern Kansas in an open field at a wetland restoration site. The collectors speculated that the occurrence likely resulted from an accidental introduction via the seed mix used for the restoration. (W)

Voucher specimens: U.S.A. KANSAS: CHEROKEE CO.: from Chetopa, ca 3 mi E on Hwy 166, 1 mi N and 0.5 mi E, and N of country road, SW Greenlawn Rd, 37.05°N, 95.02°W, 15 Jun 2016, *K. Kindscher* 4316 *et al.*; 27 Jul 2016, *H. Loring* 6356 & *A. Isenburg*; 20 Sep 2016, *K. Kindscher* 4351 & *A. Isenburg*.

**Styphnolobium japonicum* (L.) Schott (Fabaceae). Japanese pagoda tree is native to China and is a popular shade and ornamental tree in Europe (Ball 1968) and North America (Rehder 1927, Dirr 1998). The species has been cultivated in eastern Kansas since at least 1915 (KANU 160170). Though described by Isley (1998) as only “slightly escaped,” it has been documented outside of cultivation in Maryland, New York, North Carolina, Ohio, Pennsylvania, and Virginia (Rhoads & Block 2007, Weakley 2015, USDA, NRCS 2019). Japanese pagoda tree was reported from Kansas by Haddock and Freeman (2019) without voucher citations. Here we provide voucher information for the species, which appears to spread readily in urban woodlots from seeds dispersed from nearby cultivated trees.

Voucher specimens: U.S.A. KANSAS. DOUGLAS CO.: Lawrence, just S of intersection of 15th St and Learnard Ave, 38.96°N, 95.23°W, 23 Oct 2012, *C.A. Morse* 23814 & *H.S. Morse*; Lawrence, SE corner of intersection of 19th and Iowa streets, 38.95°N, 95.26°W, 10 May 2013, *C.A. Morse* 23913; Lawrence, University of Kansas Campus, just NW of intersection of 15th St and Naismith Dr, 38.96°N, 95.25°W, 12 Jul 2013, *C.A. Morse s.n.*; Lawrence, University of Kansas Campus, behind Bailey Hall, along N side of Poplar Lane, 38.96°N, 95.25°W, 1 Aug 2014, *C.A. Morse* 23979b; 4 Sep 2013, *C.A. Morse* 23979; Lawrence, parking lot at N end of New York St, just E of former Riverfront Outlet Mall building, 38.97°N, 95.23°W, 5 Oct 2013, *C.A. Morse* 24044 & *H.S. Morse*; Lawrence, NE corner of intersection of 5th and Indiana streets, 38.97°N, 95.24°W, 08 Aug 2016, *C.A. Morse* 25198 & *H.S. Morse*; Lawrence, University of Kansas West Campus, just NE of Lied Center of Kansas, 38.96°N, 95.26°W, 12 Jun 2018, *C.A. Morse s.n.* SALINE CO.: N side of Salina, Thomas Park, along W side of N 9th St, 38.87°N, 97.61°W, 11 Oct 2014, *C.A. Morse* 24331 *et al.*

****Tarenaya hassleriana*** (Chodat) Iltis (Cleomaceae). Pink-queen, native to South America, is a showy, widely cultivated, ornamental annual that occasionally escapes and naturalizes (Tucker & Iltis 2010). It has been documented in most states east of the Great Plains and in the province of Quebec, Canada (Tucker & Iltis 2010). McGregor et al. (1976) reported it (under the misapplied name *Cleome houtteana* Schltdl.) as a non-naturalized alien that was infrequently cultivated in Kansas and known from collections from Wilson (1896) and Cowley (1972) counties, but it is not clear from the label data if those collections were from cultivated or escaped plants. The species' popularity as an ornamental has increased in Kansas over the past four decades. Several recent collections from definitively escaped plants suggest that pink-queen might be encountered outside of cultivation with increasing frequency in Kansas. (W)

Voucher specimens: U.S.A. KANSAS: DOUGLAS CO.: Lawrence, University of Kansas Campus West, weedy fescue meadow along two-track, 38°56'49"N, 95°16'05"W, 14 Jul 2002, *C.A. Morse* 8525; Lawrence, SW side of town on N side of Clinton Parkway, ca 100 m WNW of intersection with Atchison Avenue, weedy bank along unnamed tributary to Yankee Tank Creek, 38.94°N, 95.27°W, 4 Sep 2016, *C.C. Freeman* 26314 & *J.A. Freeman*; Lawrence, 2006 Learnard Ave, 38.95°N, 95.23°W, 25 Oct 2019, *C.A. Morse* 27057.

****Torilis nodosa*** (L.) Gaertn. (Apiaceae). Knotted hedge-parsley is a weedy, introduced annual native to Eurasia. It has been reported from scattered localities in 18 states in the U.S. (USDA, NRCS 2019). Heretofore, the only occurrence reported from the Great Plains is from Custer County, Oklahoma (USDA, NRCS 2019). Knotted hedge-parsley recently was discovered at two sites in south-central Kansas, where it was locally abundant.

Voucher specimens: U.S.A. KANSAS: HARVEY CO.: Newton, NE side of town at S edge of Centennial Park, 38.06°N, 97.34°W, 18 May 2019, *C.C. Freeman* 27516 & *J.A. Freeman*; 25 May 2019, *C.C. Freeman* 27529 & *J.A. Freeman*; Newton, E side of town at Chisholm Middle School, N of E 1st St and E of N Blaine St, 38.04°N, 97.33°W, 25 May 2019, *C.C. Freeman* 27550 & *J.A. Freeman*.

****Verbena bonariensis*** L. (Verbenaceae). Purpletop vervain is a popular ornamental annual native to South America. It has been reported as established outside of cultivation in at least 10 states in the U.S. (Nesom 2010). It was discovered in Kansas on the Johnson County Community College campus presumably spreading by seed from cultivated plants. (W)

Voucher specimen: U.S.A. KANSAS: JOHNSON CO.: Overland Park, Johnson County Community College Campus, on NE side of Hiersteiner Child Development Center, 39.92°N, 94.73°W, 11 Sep 2014, *C.A. Morse* 24249 & *H.S. Morse*.

**Verbena brasiliensis* Vell. (Verbenaceae). Brazilian vervain is an annual or short-lived perennial native to South America. It is grown widely as a garden ornamental and has been documented as escaped from cultivation in 16 states (Nesom 2010). Brazilian vervain is reported from Kansas based on a collection from a wetland in the northeast part of the state. (W)

Voucher specimen: U.S.A. KANSAS: DOUGLAS CO.: Baker Wetlands, Tract A, N end under powerline close to Grid Pt L-2, 39.93°N, 95.24°W, 15 Aug 2017, R.L. Boyd s.n. (duplicate at Hb. Baker University).

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LITERATURE CITED

- Ackerfield, J. 2015. Flora of Colorado. Fort Worth: Botanical Research Institute of Texas Press.
- Allred, K.W., and R.D. Ivey. 2012. Flora Neomexicana III: An Illustrated Identification Manual. Published by the authors.
- Argus, G.W., and D.J. White. 1982. Atlas of the Rare Vascular Plants of Ontario. Ottawa: National Museums of Canada.
- Ball, P.W. 1968. *Sophora*. In: T.G. Tutin, V.H. Heywood, N.A. Burges, D.M. Moore, D.H. Valentine, S.M. Walters, and D.A. Webb, eds. Flora Europaea. Volume 2. Rosaceae to Umbelliferae. Cambridge: Cambridge University Press. p. 85
- Barker, W.T. 1991. Brassicaceae. In: Great Plains Flora Association. Flora of the Great Plains. Lawrence: University Press of Kansas. Pp 293-333.
- Barkley, T.M. 1991. Asteraceae. In: Great Plains Flora Association. Flora of the Great Plains. Lawrence: University Press of Kansas. Pp. 838-1021.
- Barnard, I. 2006. Exotic plant introductions in Kansas, two new species. Sida 22: 777-779.
- Brooks, R.E. 1991. Polypodiaceae. In: Great Plains Flora Association. Flora of the Great Plains. Lawrence: University Press of Kansas. Pp. 49-69.
- Burgess, L., and B.W. Hoagland. 2006. Vascular flora of a riparian site on the Canadian River, Cleveland County, Oklahoma. Oklahoma Native Plant Record 6: 69-79.
- Carruth, J.H. 1880. Botanical addenda for 1879 and 1880. Transactions of the Kansas Academy of Science 7: 120-128.

- Catling, P.M. 2005. Identification and status of the introduced black pine, *Pinus nigra*, and mugo pine, *Pinus mugo*, in Ontario. Canadian Field-Naturalist 119: 224–232.
- Cholewa, A.F. 2009. *Lysimachia*. In: Flora of North America Editorial Committee, eds. Flora of North American North of Mexico. New York and Oxford: Oxford University Press. Vol. 8, pp. 308–318.
- Cochrane, T.S., and R.F.C. Naczi. 2002. *Carex* sect. *Granulares*. In: Flora of North America Editorial Committee, eds. Flora of North American North of Mexico. New York and Oxford: Oxford University Press. Vol. 23, pp. 440–442.
- Correll, D.S., and M.C. Johnston. 1970. Manual of the Vascular Plants of Texas. Renner: Texas Research Foundation.
- Dirr, M.A. 1998. Manual of Woody Landscape Plants, 5th edition. Champaign, IL: Stipes Publishing.
- Eilers, L.J., and D.M. Roosa. 1994. The Vascular Plants of Iowa: An Annotated Checklist and Natural History. Iowa City: University of Iowa Press.
- Freckmann, R.W., and M.G. Lelong. 2003. *Steinchisma*. In: Flora of North America Editorial Committee, eds. Flora of North American North of Mexico. New York and Oxford: Oxford University Press. Vol. 25, p. 563.
- Freeman, C.C. 2000. Vascular plants new to three states in the central United States. Transactions of the Kansas Academy of Science 103: 51–54.
- Freeman, C.C. 2019. *Penstemon*. In: Flora of North America Editorial Committee, eds. Flora of North American North of Mexico. New York and Oxford: Oxford University Press. Vol. 17, pp. 82–255.
- Freeman, C.C., R.L. McGregor, and C.A. Morse. 1998. Vascular plants new to Kansas. Sida 18: 593–604.
- Freeman, C.C., C.A. Morse, and R.L. McGregor. 2003. New vascular plant records for the grassland biome of central North America. Sida 20: 1289–1297.
- Gleason, H.A., and A. Cronquist. 1991. Manual of the Vascular Plants of Northeastern United States and Adjacent Canada, 2nd edition. Bronx: New York Botanical Garden.
- Graham, S.A. 1975. Taxonomy of the Lythraceae in the southeastern United States. Sida 6: 80–103.
- Great Plains Flora Association. 1977. Atlas of the Flora of the Great Plains. Ames: Iowa State University Press.
- Haddock, M.J., and C.C. Freeman. 2019. Trees, Shrubs, and Woody Vines in Kansas, revised and expanded edition. Lawrence: University Press of Kansas.
- Haynes, R.R. 2000. Hydrocharitaceae. In: Flora of North America Editorial Committee, eds. Flora of North American North of Mexico. New York and Oxford: Oxford University Press. Vol. 22, pp. 26–38.
- Hermann, F.J. 1936. The genus *Carex* in Kansas. American Midland Naturalist 17: 849–865.
- Isley, D. 1998. Native and Naturalized Leguminosae (Fabaceae) of the United States (Exclusive of Alaska and Hawaii). Provo (UT): Monte L. Bean Life Science Museum, Brigham Young University.

- Kaul, R.B. 1991. Loasaceae. In: Great Plains Flora Association. Flora of the Great Plains. Lawrence: University Press of Kansas. Pp. 269–273.
- Kaul, R.B., D. Sutherland, and S. Rolfsmeier. 2011. The Flora of Nebraska, 2nd edition. Lincoln: School of Natural Resources, University of Nebraska-Lincoln.
- Keil, D.J. 2006. *Carduus*. In: Flora of North America Editorial Committee, eds. Flora of North American North of Mexico. New York and Oxford: Oxford University Press. Vol. 19, pp. 91–94.
- Kolstad, O.A. 1991. Cyperaceae. In: Great Plains Flora Association. Flora of the Great Plains. Lawrence: University Press of Kansas. Pp. 1059–1113.
- Kral, R. 1993. *Pinus*. In: Flora of North America Editorial Committee, eds. Flora of North American North of Mexico. New York and Oxford: Oxford University Press. Vol. 2, pp. 373–398.
- Krings, A. 2011. *Pistacia chinensis* (Anacardiaceae) naturalized in North Carolina, U.S.A. Journal of the Botanical Research Institute of Texas 5: 867–869.
- Lamont, E.E., S.D. Glenn, and S.M. Young. 2011. Noteworthy plants reported from the Torrey Range—2009 and 2010. Journal of the Torrey Botanical Society 138: 472–484.
- Lesica, P. 2012. Manual of Montana Vascular Plants. Fort Worth: Botanical Research Institute of Texas Press.
- Ma, J., and G.A. Levin. 2016. *Euonymus*. In: Flora of North America Editorial Committee, eds. Flora of North American North of Mexico. New York and Oxford: Oxford University Press. Vol. 12, pp. 122–125.
- Mastrogiuseppe, J., P.E. Rothrock, A.C. Dibble, and A.A. Reznicek. 2002. *Carex* sect. *Ovales*. In: Flora of North America Editorial Committee, eds. Flora of North American North of Mexico. New York and Oxford: Oxford University Press. Vol. 23, pp. 332–378.
- McGregor, R.L. 1977. Rare native vascular plants of Kansas. Technical Publications of the State Biological Survey of Kansas 5: 1–44.
- McGregor, R.L., R.E. Brooks, and L.A. Hauser. 1976. Checklist of Kansas vascular plants. Technical Publications of the State Biological Survey of Kansas 2: 1–168.
- Mohlenbrock, R.H. 1986. Guide to the Vascular Flora of Illinois, revised and enlarged edition. Carbondale: Southern Illinois University Press.
- Morse, C.A., C.C. Freeman, and R.L. McGregor. 2007. New, corrected, and interesting records for the Kansas vascular flora. Journal of the Botanical Research Institute of Texas 1: 753–761.
- Morton, J.K. 2005. *Cerastium*. In: Flora of North America Editorial Committee, eds. Flora of North American North of Mexico. New York and Oxford: Oxford University Press. Vol. 5, pp. 74–93.
- Nesom, G.L. 2000. Which non-native plants are included in floristic accounts? Sida 19: 189–193.
- Nesom, G.L. 2009. Assessment of invasiveness and ecological impact in non-native plants of Texas. Journal of the Botanical Research Institute of Texas 3: 971–991.
- Nesom, G.L. 2010. Taxonomic notes on *Verbena bonariensis* (Verbenaceae) and related species in the USA. Phytoneuron 2010-12: 1–16.

- Nixon, K.C., and C.H. Muller. 1997. *Quercus* sect. *Quercus*. In: Flora of North America Editorial Committee, eds. Flora of North American North of Mexico. New York and Oxford: Oxford University Press. Vol. 3, pp. 471–506.
- Paris, C.A. 1993. *Adiantum*. In: Flora of North America Editorial Committee, eds. Flora of North American North of Mexico. New York and Oxford: Oxford University Press. Vol. 2, pp. 125–130.
- Pennell, F.W. 1935. The Scrophulariaceae of eastern temperate North America. Monographs of the Academy of Natural Sciences of Philadelphia 1: 1–650.
- Pryer, S.Y., N. Snow, and J. Kartesz. 2019. Floristic survey of vascular plants in Crawford and Cherokee counties in southeastern Kansas, U.S.A. Journal of the Botanical Research Institute of Texas 13: 545–591.
- Rehder, A. 1927. Manual of the Cultivated Trees and Shrubs Hardy in North America. New York: MacMillan Company.
- Reveal, J.L. 2005. *Erigeron*. In: Flora of North America Editorial Committee, eds. Flora of North American North of Mexico. New York and Oxford: Oxford University Press. Vol. 5, pp. 221–430.
- Rhoads, A.F., and T.A. Block. 2005. Trees of Pennsylvania: A Complete Reference Guide. Philadelphia: University of Pennsylvania Press.
- Rhoads, A.F., and T.A. Block. 2007. The Plants of Pennsylvania, an Illustrated Manual, 2nd edition. Philadelphia: University of Pennsylvania Press.
- Rothrock, P.E., and A.A. Reznicek. 2002. *Carex* sect. *Paniceae*. In: Flora of North America Editorial Committee, eds. Flora of North American North of Mexico. New York and Oxford: Oxford University Press. Vol. 23, pp. 426–431.
- Schenk, J.J., and L.D. Hufford. 2016. *Mentzelia* sect. *Bartonia*. In: Flora of North America Editorial Committee, eds., Flora of North American North of Mexico. New York and Oxford: Oxford University Press. Vol. 12, pp. 498–524.
- Schilling, E.E. 2006. *Helianthus*. In: Flora of North America Editorial Committee, eds. Flora of North American North of Mexico. New York and Oxford: Oxford University Press. Vol. 21, pp. 141–169.
- Scoggan, H.J. 1978. The Flora of Canada, Part 3 – Dicotyledonae (Saururaceae to Violaceae). National Museum of Natural Sciences of Canada Publications in Botany 7: 547–1115.
- Semple, J.C. 1983. Range expansion of *Heterotheca camporum* (Compositae: Astereae) in the southeastern United States. Brittonia 35: 140–146.
- Semple, J.C. 1996. A revision of *Heterotheca* sect. *Phyllothea* (Nutt.) Harms (Compositae: Asteraeae): The prairie and montane goldenasters of North America. University of Waterloo Biology Series 37: 1–164.
- She, M., and M.F. Watson. 2005. *Cyclospermum*. In: Z.Y. Wu, P. H. Raven, and D. Y. Hong, eds. Flora of China. Beijing: Science Press and St. Louis: Missouri Botanical Garden Press. Vol. 14, pp. 114–115.
- Singhurst, J.R., and W.C. Holmes. 1998. *Facelis retusa* (Lam.) Sch. Bip. (Asteraceae) and *Plantago heterophylla* (Plantaginaceae): new to Kansas. Transactions of the Kansas Academy of Science 101: 58–59.

- Singhurst, J.R., and W.C. Holmes. 2005. *Uvularia sessilifolia* L. (Liliaceae): new to Kansas. Transactions of the Kansas Academy of Science 108: 57–58.
- Singhurst, J.R., and W.C. Holmes. 2017. *Monarda russeliana* (Lamiaceae) in Kansas. Phytoneuron 2017-1: 1–3.
- Singhurst, J.R., J.N. Mink, and W.C. Holmes. 2010. New and noteworthy plants of Texas. Phytologia 92: 249–255.
- Singhurst, J.R., J.N. Mink, and W.C. Holmes. 2018. *Ranunculus parviflorus* (Ranunculaceae) naturalized in Kansas. Phytoneuron 2018-22: 1–3.
- Smith, S.G. 2002. *Schoenoplectus*. In: Flora of North America Editorial Committee, eds. Flora of North American North of Mexico. New York and Oxford: Oxford University Press. Vol. 23, pp. 44–60.
- Smith, S.G., J.J. Bruhl, M. Socorro González-Elizondo, and F.J. Menapace. 2002. *Eleocharis*. In: Flora of North America Editorial Committee, eds. Flora of North American North of Mexico. New York and Oxford: Oxford University Press. Vol. 23, pp. 60–120.
- Smyth, B.B. 1898. Additions to the flora of Kansas. Transactions of the Kansas Academy of Science 16: 158–167.
- Snow, N. 2017. New records of vascular plants for Kansas. Phytoneuron 2017-1: 1–2.
- Snow, N. 2018. Erratum: *Cenchrus alopecuroides*. Phytoneuron 2018-23: 1.
- Steyermark, J.A. 1977. Flora of Missouri, 7th printing. Ames: Iowa State University Press.
- Sutherland, D. 1991. Poaceae. In: Great Plains Flora Association. Flora of the Great Plains. Lawrence: University Press of Kansas. Pp. 1113–1235.
- Swink, F., and G. Wilhelm. 1994. Plants of the Chicago Region, 4th edition. Lisle, IL: The Morton Arboretum.
- Tallent-Halsell, N.G., and M.S. Watt. 2009. The invasive *Buddleja davidii* (butterfly bush). Botanical Review 75: 292. <https://doi.org/10.1007/s12229-009-9033-0>.
- Tucker, G.C. 1987. New Records of *Cyperus* (Cyperaceae) from West Virginia. Castanea 52: 145–146.
- Tucker, G.C. 2000. Some notable plant records from east-central and southern Illinois. Erigenia 18: 75–79.
- Tucker, G.C., B.G. Marcks, and J.R. Carter. 2002. *Cyperus*. In: Flora of North America Editorial Committee, eds., Flora of North American North of Mexico. New York and Oxford: Oxford University Press. Vol. 23, pp. 141–191.
- Tucker, G.C., and H.H. Iltis. 2010. *Tarenaya*. In: Flora of North America Editorial Committee, eds. Flora of North American North of Mexico. New York and Oxford: Oxford University Press. Vol. 7, pp. 218–219.
- Turner, B.L., H. Nichols, G. Denny, and O. Doron. 2003a. Atlas of the vascular plants of Texas, vol. 1. Sida, Botanical Miscellany 24: 1–648.
- Turner, B.L., H. Nichols, G. Denny, and O. Doron. 2003b. Atlas of the vascular plants of Texas, vol. 2. Sida, Botanical Miscellany 24: 649–888.
- Turner, S.R., and G. Davidse. 2017. The first Missouri occurrences of *Cerastium dubium* (anomalous mouse-eared chickweed). Missouriensis 34: 20–23.

- USDA, NRCS. 2019. The PLANTS Database (<http://plants.usda.gov>, accessed 2 November 2019). National Plant Data Team, Greensboro, NC 27401-4901 USA.
- Vincent, M.A., and R.L. Gardner. 2016. Spread of the invasive Ravenna grass (*Tripidium ravennae*) in Ohio. *Phytoneuron* 2016-78: 1–9.
- Voss, E.G. 1972. Michigan Flora. Part I: Gymnosperms and Monocots. Bloomfield Hills (MI): Cranbrook Institute of Science.
- Weakley, A.S. 2015. Flora of the Southern and Mid-Atlantic States (working draft 21 May 2015). Chapel Hill: University of North Carolina Herbarium.
- Webster, C.R., M.A. Jenkins, and S. Jose. 2006. Woody invaders and the challenges they pose to forest ecosystems in the eastern United States. *Journal of Forestry* Oct/Nov 2006: 266–374.
- Webster, G.L. 1970. A revision of *Phyllanthus* (Euphorbiaceae) in the continental United States. *Brittonia* 22: 44–76.
- Webster, R.D. 2003. *Saccharum*. In: Flora of North America Editorial Committee, eds. Flora of North America North of Mexico. New York and Oxford: Oxford University Press. Vol. 26, pp. 609–616.
- Wilhelm, G., and L. Rericha. 2017. Flora of the Chicago Region: A Floristic and Ecological Synthesis. Indianapolis: Indiana Academy of Science.
- Williams, L.O. 1927. A Monograph of the genus *Mertensia* in North America. *Annals of the Missouri Botanical Garden* 24: 17–159.
- Whittemore, A.T. 2004. Sawtooth oak (*Quercus acutissima*, Fagaceae) in North America. *Sida* 21: 447–454.
- Yatskievych, G. 1999. Steyermark's Flora of Missouri. Vol. 1. Jefferson City: Missouri Department of Conservation.
- Yatskievych, G. 2006. Steyermark's Flora of Missouri. Vol. 2. St. Louis: Missouri Botanical Garden Press.
- Yatskievych, G. 2013. Steyermark's Flora of Missouri. Vol. 3. St. Louis: Missouri Botanical Garden Press.

Erythranthe geyeri (Torr.) G.L. Nesom (roundleaf monkeyflower) rediscovered in Missouri

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ABSTRACT. — A record of the native plant, *Erythranthe geyeri*, is reported from a spring in Christian County, Missouri. This species was previously known only from historical records in Missouri, and was considered to have been possibly extirpated from the state. This finding represents an important new occurrence record of this species of conservation concern.

INTRODUCTION

Erythranthe geyeri (Torr.) G.L. Nesom (Phrymaceae) is widely distributed in the United States from Michigan westward, southward throughout much of Mexico (Grant 1924, Barker et al. 2012, Nesom 2012, USDA 2019), and northward throughout much of Canada. We have opted here to use the species name proposed by Nesom (2012). Previously the species was treated with *Erythranthe glabrata* (Kunth) G.L. Nesom for which several subspecies were recognized (Vickery 1990, Yatskievych 2013), including *E. glabrata* var. *jamesii* from Missouri. The conservation status of this and related species is of concern in some states. *Erythranthe geyeri* (as *Mimulus grabratus*) is listed as state endangered in Illinois and threatened in Iowa. A closely related species, *Erythranthe michiganensis* (Pennel) G.L. Nesom (Michigan monkeyflower) from Michigan, is listed as state and federally endangered in that state. In Missouri, *E. geyeri* (as *E. glabrata* var. *jamesii*) is a species of conservation concern, where it is listed as possibly extirpated (Missouri Department of Conservation 2019).

Erythranthe geyeri is known only from historical collections from a few counties in Missouri. This species was previously reported from Bates, Barry, Cass, Greene, Holt, Lawrence, and Ste. Genevieve counties (Palmer & Steyermark 1935, Yatskievych 2013, USDA 2019). Here we report a previously unknown population of *E. geyeri* (Figs. 1-3) from Christian County, Missouri. This population was discovered October 22, 2018 at Brown Spring in Christian County during a study by the primary author of ten springs distributed among Greene, Christian, and Stone counties in Missouri. Steyermark (1941) did not report *E. geyeri* from any of the springs he surveyed, but Yatskievych (2013) indicated the habitat of *E. geyeri* was springlets, spring branches, wet ledges, and that it can become an emergent aquatic species. The springs surveyed during this study were all of similar size with approximately third to fourth magnitude flow rates (Vineyard et al. 1974). Nine of the springs flow through a limestone substrate primarily within the

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Springfield plateau, but *E. geyeri* was discovered in the one spring that flows through dolomitic substrate along the southwestern portion of the Salem plateau.



Figure 1: Roundleaf monkeyflower (*Erythranthe geyeri*) collected from a spring in Christian County, Missouri. **A:** Habitus of the plant in the spring habitat, **B:** Arrangement of the flowers on the plant, **C:** Close-up of a flower.

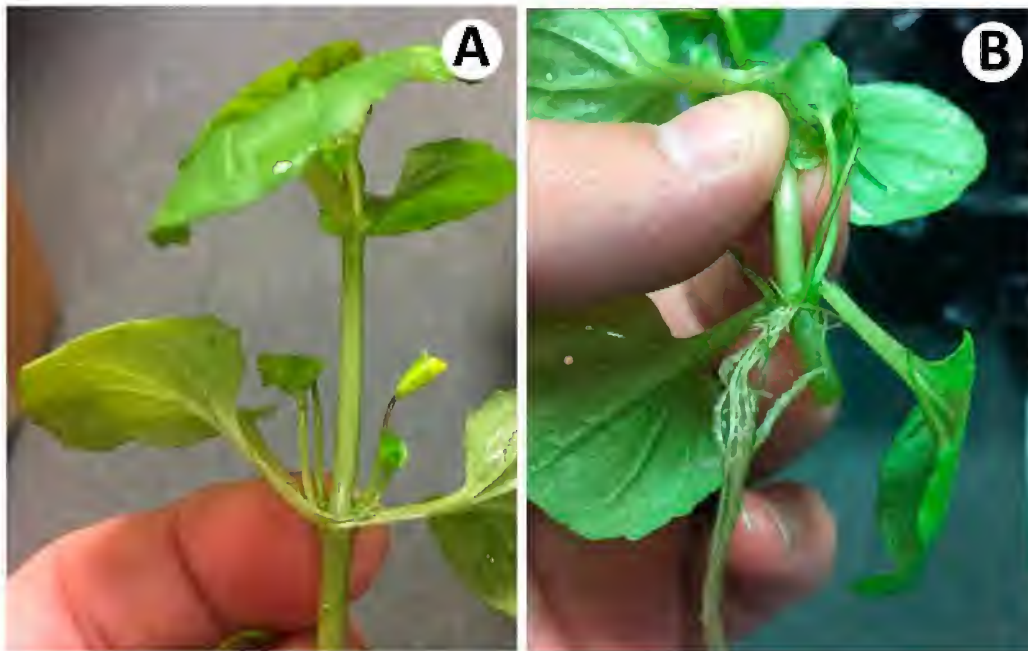


Figure 2. Roundleaf monkeyflower (*Erythranthe geyeri*). **A:** Flower arrangement at a node, **B:** Adventitious roots issuing from a node. All photographs by David Bowles.

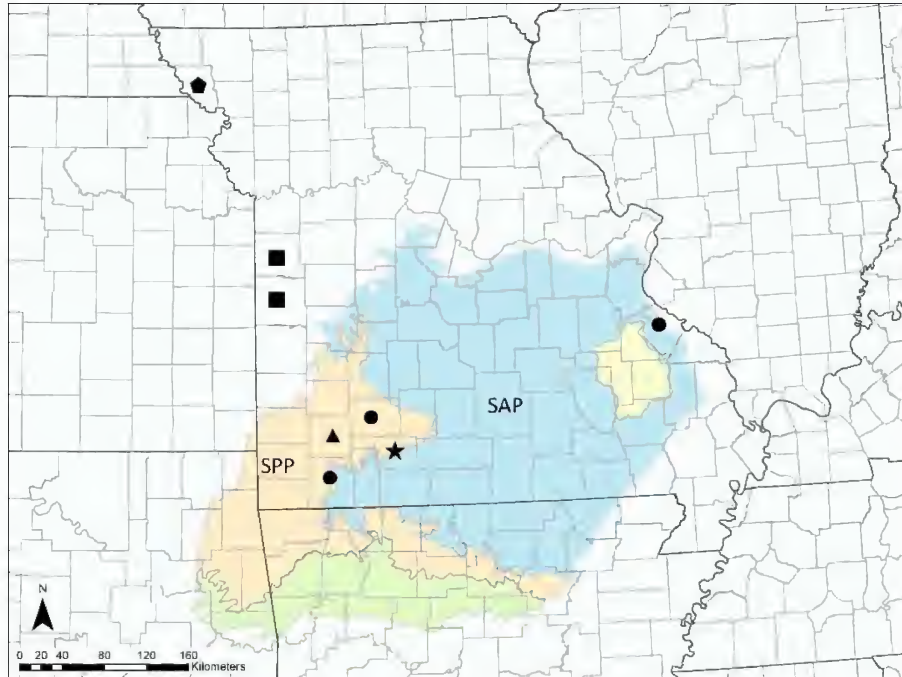


Figure 3: Map showing the known distribution of *Erythranthe geyeri* in Missouri. Distributional records are: circles (Palmer & Steyermark 1935), squares (Weber et al. 2000), triangle (Yatskievych 2013), pentagon (USDA 2019), and star (this study). SAP=Salem Plateau, SPP=Springfield Plateau.

The population of *E. geyeri* reported here was found growing partially submersed around the spring's margins. No individual plants were found growing fully submersed or beyond the margins of the spring. We found these specimens in flower during late September to early October, and we did not notice flowers prior to that time. The spring is slow-flowing ($\sim 0.053 \text{ m}^3/\text{sec}$ average) and excavated into a small impoundment located several meters ($\sim 51\text{m}$) downstream of the source. The area surrounding the spring is a manicured lawn where a few roads, houses and other structures are located. Examples of *E. geyeri* were found only in the spring-run downstream of the impoundment. Several other angiosperms, moss and filamentous algae were also observed at the spring (Table 1). Modification of stream channels that increase flow stability and reduce disturbance often benefit aquatic plant colonization and abundance (Bunn & Arthington 2002). The modified spring channel where *E. geyeri* was found may be at least partially responsible for its presence there. The soils around the margins of the spring remain thoroughly saturated year-round and the surrounding manicured lawn may reduce intrusion by other wetland species. We suspect these conditions may reduce competition with other wetland plants and promote the growth of this species. High inputs of dissolved magnesium, an element crucial to photosynthesis, in this dolomitic spring may further provide favorable conditions that support growth of *E. geyeri* (Tränkner et al. 2018).

Table 1: Aquatic vegetation associated with the spring where *Erythranthe geyeri* was discovered.

TAXON	COMMON NAME	NICHE HABITAT
Algae		
<i>Cladophora</i> sp.	Green algae	Submersed
<i>Hydrodictyon</i> sp.	Water net	Submersed
<i>Spirogyra</i> sp.	Water silk	Submersed
Mosses		
Fontinalaceae	Moss	Submersed
Flowering Plants		
<i>Lemna minor</i> L.	Common duckweed	Floating, marginal
<i>Poa annua</i> L.	Annual bluegrass	Submersed, emergent
<i>Potamogeton foliosus</i> Raf.	Leafy pondweed	Submersed
<i>Impatiens capensis</i> Meerb.	Spotted Jewelweed	Emergent, marginal
<i>Nasturtium officinale</i> W.T. Aiton	Watercress	Emergent, floating
<i>Euonymus fortunei</i> (Turcz.) Hand.-Maz.	Winter creeper	Marginal
<i>Mentha aquatica</i> L. (<i>Mentha x piperita</i>)	Watermint (Peppermint)	Emergent, marginal
<i>Erythranthe geyeri</i> (Torr.) G.L. Nesom	Roundleaf monkeyflower	Emergent, marginal
<i>Persicaria longiseta</i> (Bruijn) Kitag	Oriental lady's thumb	Emergent, marginal
<i>Rumex obtusifolius</i> L.	Bitter dock	Emergent, marginal

Wetland areas in southwest Missouri are often small, fragmented, and can be subjected to encroaching human development and other anthropogenic disturbances. We have extensively surveyed multiple spring habitats in southern Missouri and found that Brown Spring contains the only observed population of *E. geyeri*. More information on specific habitat requirements of this species may help clarify the potential distribution of this apparently rare plant in Missouri.

Furthermore, we suggest that *E. geyeri* be retained as a species of concern for conservation status in Missouri until sufficient data shows a wider and more secure distribution of suitable habitat and populations.

Specimen cited: U.S.A. MISSOURI: CHRISTIAN CO.: Brown Spring, 26 September 2018, Cheri & Bowles s.n. (SMS).

ACKNOWLEDGMENTS

We would like to thank Marceline Matlock for permitting us access to the spring where *E. glabrata* was discovered. We thank Dr. Michelle Bowe for her guidance in curating and indexing museum specimens. Jeff Williams designed the state locale map. The comments of two anonymous reviewers improved this paper.

LITERATURE CITED

- Bunn, S.E., and A.H. Arthington. 2002. Basic principles and ecological consequences of altered flow regimes for aquatic biodiversity. *Environmental Management* 30: 492–507.
- Barker, W.R., G.L. Nesom, P.M. Beardsley, and N.S. Fraga. 2012. A taxonomic conspectus of Phrymaceae: a narrowed circumscriptions for *Mimulus*, new and resurrected genera, and new names and combinations. *Phytoneuron* 2012-39: 1–60.
- Grant, A.L. 1924. A monograph of the genus *Mimulus*. *Annals of the Missouri Botanical Garden* 11: 99-388.
- Missouri Department of Conservation. 2019. Missouri Species and Communities of Conservation Concern. Jefferson City: Missouri Department of Conservation.
- Nesom, G.L. 2012. Taxonomy of *Erythranthe* sect. *Simiola* (Phrymaceae) in the USA and Mexico. *Phytoneuron* 2012-40: 1–123.
- Palmer, E.J., and J.A. Steyermark. 1935. An annotated catalogue of the flowering plants of Missouri. *Annals of the Missouri Botanical Garden* 22: 375-758.
- Steyermark, J.A. 1941. Studies of the vegetation of Missouri—II. Phanerogamic flora of the freshwater springs in the Ozarks of Missouri. *Publications of the Field Museum of Natural History, Botanical Series* 9: 476–641.
- Tränkner, M., E. Tavakol, and B. Jäkil. 2018. Functioning of potassium and magnesium in photosynthesis, photosynthate translocation and phytoprotection. *Physiologia Plantarum* 163: 414-431.
- USDA, NRCS (United States Department of Agriculture, Natural Resources Conservation Service). 2019. The PLANTS Database [Online] Available at: <http://plants.usda.gov> (Accessed February 2019). Greensboro, NC: National Plant Data Team.
- Vickery, Robert K. Jr. 1990. Close correspondence of allozyme groups to geographic races in the *Mimulus glabratus* complex (Scrophulariaceae). *Systematic Botany* 15: 481-496.
- Vineyard, J.D., G.L. Feder, W.L. Pflieger, and R.G. Lipscomb. 1974. Springs of Missouri. Rolla: Missouri Geological Survey Water Resources Report No. 29

Missouriensis, 37: 39-44. 2019.

**pdf effectively published online 30 December 2019 via <https://monativeplants.org/missouriensis>*

Weber, W.R., W.T. Corcoran, M.S. Brunell, and P.L. Redfearn, Jr. 2000. Atlas of Missouri vascular plants. Springfield: Ozarks Regional Herbarium. Southwest Missouri State University.

Yatskievych, G. 2013. Steyermark's Flora of Missouri. Vol. 3. St. Louis: Missouri Botanical Garden Press.

Distribution of *Thaspium chapmanii* and *T. barbinode* (Apiaceae) in Missouri

AARON FLODEN¹

ABSTRACT. — The number of species of *Thaspium* in Missouri is corrected to include *T. barbinode*, *T. chapmanii*, and *T. trifoliatum*. The distribution of the former two in the state and their different habitat preferences are discussed. A key to *Thaspium* and county level distribution maps for Missouri are included.

Thaspium Nutt. (Apiaceae) in Missouri includes three species, although Yatskievych (2006) only included *T. barbinode* (Michx.) Nutt. and *T. trifoliatum* (L.) A. Gray (including variety *flavum* S.F. Blake). A third species, *T. chapmanii* (Coult. & Rose) Small, has been included as a synonym of *T. barbinode*, although some floristic treatments in the southeastern U.S. have treated it as a species (Small 1933, Tennessee Flora Committee 2015, Weakley 2015), and it will be included as a species in the upcoming Flora of North America treatment (D. Estes & B. Mason, pers. comm.). Yatskievych (2006) provides a distribution of *T. barbinode* through much of Missouri, but mostly absent north of the Missouri River. It is reported from a wide range of edaphic conditions from bottomland forests, bluffs, fens, prairies, and glade margins. The recognition of *T. chapmanii* as distinct from the sympatric *T. barbinode* in the state requires clarification of the morphological differences between the two species, their distributions in Missouri, and clarification of individual habitat preferences.

The morphological differences separating *Thaspium chapmanii* and *T. barbinode* are slight when observed as individual characters on herbarium specimens, but as a suite of characters they differentiate the species well. Their differences are more apparent when the plants are observed in the field. *Thaspium chapmanii* is a taller, more branched plant with more divided leaves than *T. barbinode* (cauline leaves 2–3 ternate vs. 1–2 ternate in *T. barbinode*), and the margins of the leaflets are more coarsely serrate although this is not quantified here. The leaves of *T. chapmanii* are typically pubescent abaxially with trichomes present on the lamina, primary, secondary, and tertiary veins, whereas *T. barbinode* typically has abaxial pubescence, when present, restricted to the primary veins. The corollas of *T. chapmanii* are pale yellow to creamy white, while those of *T. barbinode* are golden yellow (Fig. 1). In herbarium specimens the differences in corolla color are often not as noticeable between the species, but *T. chapmanii* typically dries near white or creamy white vs. creamy yellow in *T. barbinode*. The corolla color is often not apparent on older collections due to the specimens aging brown.

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Figure 1. *Thaspium chapmanii* (left) and *T. barbinode* (right) showing the distinctive colors of the open flowers in the field. Both photos by the author.

Peduncles and umbel rays of *T. chapmanii* are scabrellous (projections with acute apices) on their adaxial side and those of *T. barbinode* are glabrous to occasionally papillose-roughened (projections with obtuse apices) (Fig. 2). Mature fruits of *T. chapmanii* are smaller than those of *T. barbinode* (4–5 mm long vs. 5–6 mm) and minutely spinulose to scabrellous between the wings of the schizocarps (vs. glabrous or rarely scabrellous), although this character can be absent in late season collections of *T. chapmanii* when the whole stem has begun to senesce. The wings of the seeds develop well before the fruits are mature and only measurements of mature fruits will fall into the ranges provided. Differences not discernible from preserved specimens that are apparent in the field are the typically multi-branched habit of *T. chapmanii* and the generally larger umbel size which is in part because of the presence of a greater number of umbellules (9–16, vs. 6–12 in *T. barbinode*).

Despite this, there is significant overlap between the two species in the umbel size, umbellule number, and flowers per umbellule. Neither character preserves well, because specimens selected for preservation are often smaller plants from a population. Furthermore, the diameter of the umbels of fresh material is not preserved when the collected plants begin to wilt, and the umbels are often distorted upon pressing. Moreover, the age of a plant and the fertility of the habitat can contribute to large plant sizes. Lastly, the flowering period of the two species

overlaps, but *T. chapmanii* is typically later in reaching peak flowering from late May through June, whereas *T. barbinode* peaks in mid-May and continues into June. A key to the species following TNFC (2015) is presented below to delimit the species of *Thaspium* in Missouri.



Figure 2. *Thaspium chapmanii* (left) showing the scabrellous umbel rays, and *T. barbinode* (right) showing the glabrous umbel rays. Scale bar 2 mm.

Optimum habitats for *Thaspium chapmanii* and *T. barbinode* differ in their preferences for moisture and light. Specimens assignable to *T. chapmanii* have been reported from glade edges, bluff tops, prairies, rocky banks, stream floodplains, and open woodlands, whereas *T. barbinode* has been collected from more mesic habitats such as steep, mesic limestone and sandstone wooded bluffs (typically north-facing), near springheads, and on river bluffs. For a few older collections, it is unclear what the habitat was, but in general the habitat preference of *T. barbinode* is for more mesic, richer, and more shaded habitats than that of *T. chapmanii*.

The treatment of *Thaspium chapmanii* as a species distinct from *T. barbinode* requires clarification of the distributions of the two species in the state (Fig. 3). *Thaspium chapmanii* is relatively common south of the Missouri River, especially in the Ozark and Big Rivers regions, with some scattered occurrences outside these regions. *Thaspium barbinode* is infrequent in Missouri and the specimens below represent the documented distribution in the state. It has been documented from scattered sites in the Ozarks, the central and eastern Big Rivers region, and the northeast corner of Missouri. The few collections, and especially the absence of many recent collections, qualify the species as worthy of conservation concern (S2 rank; < 21 populations) in Missouri. It is unlikely that it is under any natural threat and its rarity is due to the preference for mesic ravines and bluff habitats, but the limited number of occurrences in the state qualifies it for conservation concern. It is potentially naturally rare in the state with the populations likely representing the sparse western edge of its distribution. Some of the historical collections below

have been recently confirmed to be extant as part of field studies relating to the Flora of North America treatment of *Thaspium*.



Figure 3. County level distributions of *Thaspium chapmanii* (left) and *Thaspium barbinode* (right) in Missouri with occurrences as centroids. Specimens mapped using centroid data (<https://data.mo.gov/Geography/Missouri-county-centroid-map>) and specimens at MO and UMO using DIVA-GIS.

Thaspium barbinode specimens examined [all other Missouri material labelled as *T. barbinode* at MO are *T. chapmanii*]: **U.S.A. MISSOURI:** CALLAWAY CO.: hanging over steep limestone bluff along Stinson Creek, sec. 34 T47N, R9W, 3 mi SE of Fulton, 10 Sep 1937, *J.A. Steyermark* 26098 (MO). **CLARK CO.: 25 Aug 1892, *B.F. Bush s.n.* (MO). *DENT CO.: around north-facing lime wooded outcrops along spring branch of Montauk Spring, Montauk State Park, 9 Aug 1936, *J.A. Steyermark* 12773 (MO). **JASPER CO.: Webb City, frequent in rich woods [duplicate specimen with handwritten label says “prairies”], 7 Jun 1903, *E.J. Palmer* 533 (MO). KNOX CO.: Newark Cliffs, ca. 1/2 mi SW of Newark; Newark Quad.; top of bluff; flowers bright yellow; N1/2 NE1/4 sec. 23 T60N R10W, 13 May 1999, *M. McHale* 99-087 (MO). LACLEDE CO.: Bennet Spring, 14 May 1939, *A. Chandler* 841 (MO). MILLER CO.: limestone slopes along Osage River south of Mary’s Home, 5 Jul 1934, *J.A. Steyermark* 13118 (MO). REYNOLDS CO.: Suttons Bluff Campground, 3 Jul 1970, *W.G. D’Arcy* 4658 (MO). SHANNON CO.: 17 Sep 1888, *B.F. Bush* (MO). STONE CO.: rocky woods, 1 Aug 1935, *B.F. Bush* 15061 (MO). TEXAS CO.: steep rocky slope & dolomitic bluff above Jacks Fork River, ca. 1 mi. s. of Harlow Ford, NW1/4 sec. 34 T28N R7W, station 14, 1 Aug 1969, *Redfearn et al.* 901 (MO). WARREN CO.: moist shaded St. Peter sandstone cliffs in ravine near Charrette Creek, about 9 mi. southeast of Warrenton, 4 Oct 1934, *J.A. Steyermark* 15861 (MO); **SE of Daniel Boone Conservation Area; NW1/4 sec. 9 T46N R04W, 16 Jul 1999, *M. Leahy* 9 (MO).

* sites visited by the author with D. Estes in 2010 as part of a survey for the FNA project.

** specimens annotated “*T. cf. barbinode*” by D. Estes.

KEY TO THE GENUS *THASPIUM* IN MISSOURI

- 1 Basal leaves 2–3 ternately compound, the margins hairy or ciliate, without a white border.
 - 2 Cauline leaves 1–2-ternate, glabrous or glabrate abaxially except for primary veins; corolla golden yellow; peduncles and umbel rays glabrous or papillose-roughened on upper surface; fruits glabrous between and on the wings, mature fruit 5–6 mm long *T. barbinode*
 - 2 Cauline leaves 2–3-ternate, puberulent on abaxial veins and lamina; corolla pale yellow to creamy white; peduncles and umbel rays scabrellous on upper surface; fruits scabrellous between and sometimes on several wings, mature fruit 4–5 mm long *T. chapmanii*
- 1 Basal leaves simple or ternately lobed or compound, the margins glabrous, with a narrow, white border *T. trifoliatum*

LITERATURE CITED

- Small, J.K. 1933. Manual of the Southeastern Flora. Chapel Hill: University of North Carolina Press.
- Tennessee Flora Committee. 2015. Guide to the Vascular Plants of Tennessee, 2nd printing. Knoxville: University of Tennessee Press.
- Weakley, A.S. 2015. Flora of the Southern and Mid-Atlantic States, working draft 21 May 2015. Chapel Hill: University of North Carolina Herbarium.
- Yatskievych, G. 2006. Steyermark's Flora of Missouri. Vol. 2. St. Louis: Missouri Botanical Garden Press.

Saxifraga tridactylites — a new, weedy saxifrage for Missouri

DOUGLAS LADD¹

ABSTRACT. — *Saxifraga tridactylites*, native to the Old World, is reported new to Missouri, from a ruderal area in Meramec State Park, Franklin County. The species differs from all other members of the Saxifragaceae in Missouri in its annual habit, alternate, narrowly lobed, succulent cauline leaves, and viscid glandular pubescence. A detailed description based on local material is provided, and the North American distribution and likely expansion are discussed.

INTRODUCTION

Rueleaf Saxifrage, *Saxifraga tridactylites* L. (Fig. 1) is a small annual native to the Old World, ranging from the Arctic Circle southward in Europe, extending into northern Africa and southwestern Asia (Brouillet & Elvander 2009, Hutchinson 1972, Polunin 1969). In its native range, it occurs in sandy or rocky sites, particularly in calcareous conditions. Scott (1995) lists the habitat in Scotland as “lime-rich grasslands and old walls in low areas”, while Stace (1997) characterizes the species as occupying “bare dry ground on walls, rocks and sand, mostly calcareous”, and being “locally common throughout most of the British Isles”.

In recent years, the species has become established in the New World. Brouillet and Elvander (2009) included the species as an adventive in coastal areas near Victoria, British Columbia, where it was listed as occurring in moist rock crevices and open sandy headlands. More recently, it has been collected in the southeastern United States; Weakley (2015) lists it from “gravel and thin soils along roads and highways” and maps it from Alabama, Mississippi, and Tennessee.

DISCUSSION

During spring 2019, before the Missouri Native Plant Society meeting at Meramec State Park, I stopped at the park boat launch area along the Meramec River, where I discovered a population of several hundred individuals of *Saxifraga tridactylites* in the parking area bordering the boat ramp, growing in thin silty soil over cracked pavement along a concrete curb. Associates included *Hordeum pusillum*, *Plantago pusilla*, *Plantago virginica*, *Poa annua*, *Sagina decumbens*, *Veronica peregrina*, and *Viola bicolor*.

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Figure 1. *Saxifraga tridactylites* in Derbyshire, England, May 2015. Photo courtesy Parkiwiki; <https://creativecommons.org/licenses/by-sa/4.0/legalcode>

Specimen cited: **U.S.A. MISSOURI:** FRANKLIN CO.: Meramec State Park, ca. 4.4 miles east of Sullivan, in parking area for boat ramp along west side of Meramec River, 38.2039°N 91.0986°W, 3 May 2019, *Ladd 35149* (MO).

In Yatskievych's (2013) key to Saxifragaceae, the species would key to *Micranthes* Haw., but would obviously not match any of the three members of that genus documented from Missouri, all of which are perennials with entire, exclusively basal leaves. *Micranthes* was formerly included within a broad concept of *Saxifraga*, but recent studies (e.g. Soltis et al. 2001) document that *Saxifraga* is polyphyletic, and *Saxifraga* sensu stricto differs from *Micranthes* in having both basal and cauline leaves, as well as smooth, tuberculate, or papillate seeds as opposed to the ribbed seeds of *Micranthes*. Additionally, *S. tridactylites* is the only annual in either genus in the North American flora, and is unique among Missouri members of the Saxifragaceae in both being an annual and having well-developed, alternate cauline leaves.

Because the species is not included in local floras, and because many existing literature accounts omit key field features, a full description is included here, based primarily on Missouri material. Diminutive annuals to 15 cm tall (winter annuals *vide* Grime 1988); becoming red with age; stems, pedicels, calices, and foliage with abundant, short, erect, gland-tipped hairs ca. 0.10–0.15 mm long; well-developed individuals with several erect stems originating near the base; sparingly and remotely branched above; leaves alternate, thick, fleshy and succulent when fresh (this character not apparent when dried), to 2 cm long, tending to be disposed in the lower half of the plant, the proximal half of the leaf tapering uniformly to a narrow base, the distal half expanded to 1 cm broad and divided into $3 \pm$ parallel, elongate, narrow lobes, sometimes with 1–3 secondary lobes; leaves in the inflorescence becoming reduced to small, often entire, widely spaced bracts; inflorescence typically more than half of total plant height, somewhat cymose, appearing open, with alternate axillary flowers borne singly on slender erect pedicels to 2 cm long; petals 5, white, entire, 2–3 mm long, broadly clawed; calyx initially divided ca. 40% of its length into 5 erect sepals, these initially smaller than the petals but expanding to 6 mm in fruit; stamens 10, slightly shorter than the petals, with subglobose anthers; ovaries mostly inferior in flower, appearing less so in fruit (described by various authors as semi-inferior to mostly inferior — e.g. Brouillet & Elvander 2009, Stace 1997); styles 2, small, erect, basally united; capsules erect, to 5×4 mm; seeds dark brown, 0.3–0.4 mm long, with longitudinal rows of minute blunt tubercles.

According to Hutchinson (1972), the fleshy yellow nectary at the base of the style produces droplets of liquid in sunny weather, suggesting insect pollination, although he notes that the flowers are also effectively self-pollinated. While all Missouri material examined had perfect flowers, Hutchinson also noted the occurrence of dioecious flowers in this species. Di Musciano et al. (2018) consider populations of this species in the mountains of central Italy to be self-pollinated.

Reisch (2007) reported that *Saxifraga tridactylites* is “spreading enormously” in calcareous anthropogenic habitats in Europe. Given its rapidly increasing presence along roadsides and interstate highway weigh stations in the southeastern states, as well as the large climate tolerance indicated by its native range, it is likely that this species will expand across the Midwest as well as other parts of North America. Its diminutive stature, annual habit, predilection for sites with minimal established vegetation, and apparent preference for calcareous substrates indicate that it will not be an ecological threat to most natural areas or native habitats, but will likely proliferate along roadsides, parking areas, and similar sites, as well as possibly becoming established on thin soils over bedrock in disturbed limestone and dolomite glades and bluff summits. Future searches of suitable habitats will likely reveal more Missouri populations.

LITERATURE CITED

- Brouillet, L. and P.E. Elvander. 2009. *Saxifraga*. In: Flora of North America Editorial Committee, eds. Flora of North America North of Mexico. New York and Oxford: Oxford University Press. Vol. 8, pp. 132-146.

- Di Musciano, M., M.L. Carranza, L. Frate, V. Di Cecco, L. Di Martino, A.R. Frattaroli, and A. Stanisci. 2018. Distribution of plant species and dispersal traits along environmental gradients in central Mediterranean summits. *Diversity* 10(3), 58; <https://doi.org/10.3390/d10030058>
- Grime, J. 1988. *Comparative Plant Ecology*. Berlin, GE: Springer.
- Hutchinson, J. 1972. *British Wild Flowers*, vol. 2. Rutherford, NJ: Fairleigh Dickinson University Press.
- Polunin, O. 1969. *Wildflowers of Europe*. London: Oxford University Press.
- Reisch, C. 2007. Genetic structure of *Saxifraga tridactylites* (Saxifragaceae) from natural and man-made habitats. *Conservation Genetics* 8(4): 893-202.
- Scott, M. 1995. *Scottish Wild Flowers*. London: HarperCollins.
- Soltis, D.E., R.K. Kuzoff, M.E. Mort, M. Zanis, M. Fishbein, L. Hufford, J. Kuntz, and M.K. Arroyo. 2001. Elucidating deep-level phylogenetic relationships in Saxifragaceae using sequences for six chloroplast and nuclear regions. *Annals of the Missouri Botanical Garden* 88: 669-693.
- Stace, C. 1997. *New Flora of the British Isles*, second ed. Cambridge, UK: Cambridge University Press.
- Weakley, A.S. 2015. *Flora of the Southern and Mid-Atlantic States*, working draft 21 May 2015. Chapel Hill: University of North Carolina Herbarium.
- Yatskievych, G. 2013. *Steyermark's Flora of Missouri*. Vol. 3. St. Louis: Missouri Botanical Garden Press.